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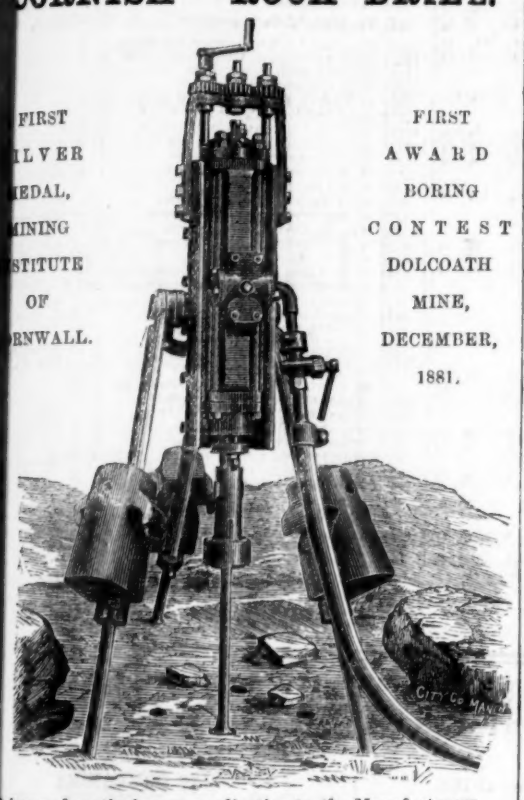

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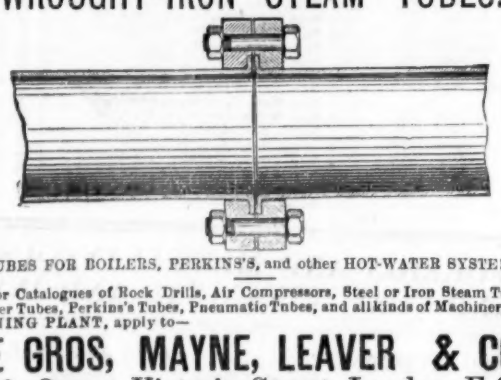
Royal Cornwall Polytechnic, 1875.
Rio de Janeiro Exhibition, 1875.
Australia Brisbane Exhibition, 1876.
Philadelphia Exhibition, 1874.
Royal Cornwall Polytechnic, 1877.
Mining Institute of Cornwall, 1877.
Paris Exhibition, 1878.

WROUGHT-IRON STEAM TUBES.



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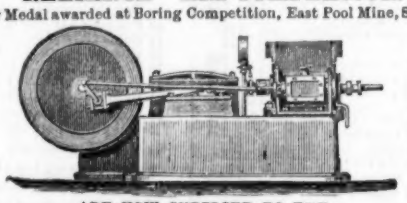

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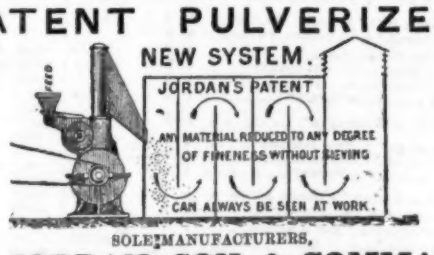

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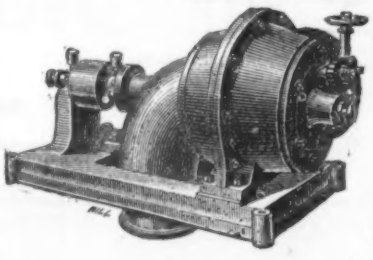

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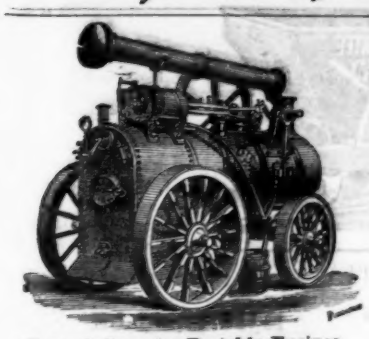

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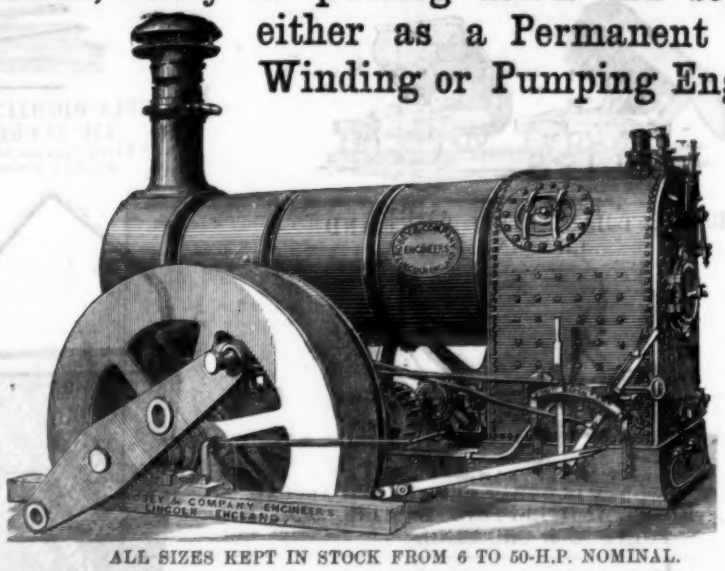

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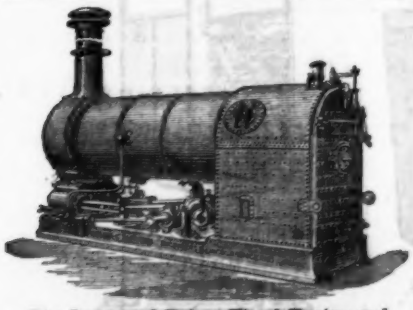

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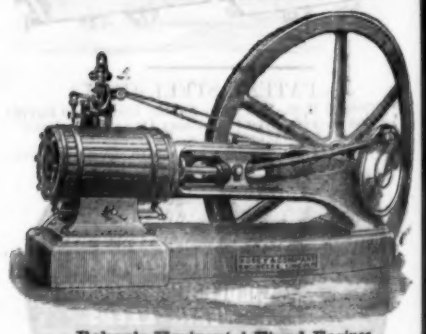

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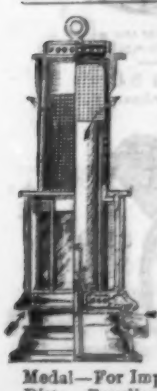

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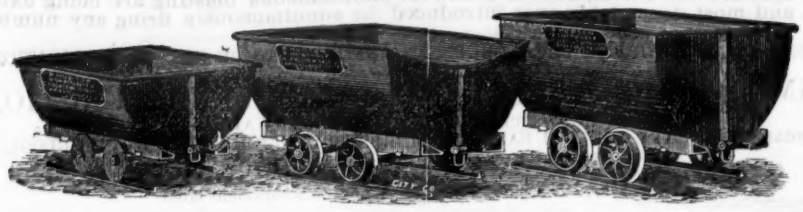
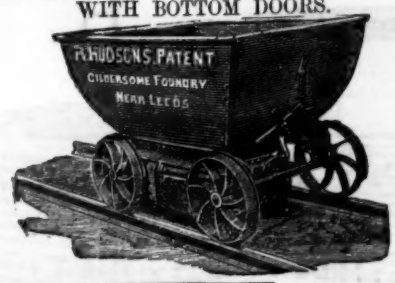
1.—PATENT STEEL END TIP WAGONS.

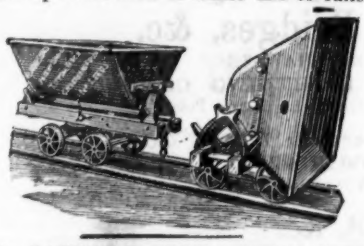
7.—PATENT STEEL MINING WAGONS.



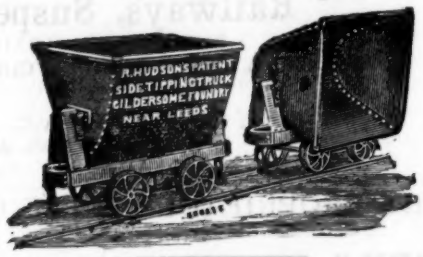
12.—PATENT STEEL HOPPER WAGON, WITH BOTTOM DOORS.



2. PATENT UNIVERSAL TRIPLE-CENTRE STEEL TIPPING TRUCK,
Will tip either SIDE or either END of rails.



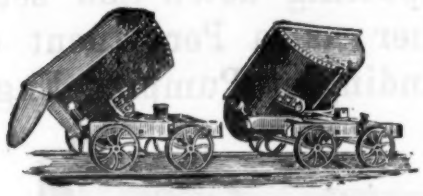
8.– PATENT DOUBLE-CENTRE STEEL SIDE TIP WAGONS,
Will tip either side of Wagons.



13.—PATENT STEEL HOPPER WAGON.

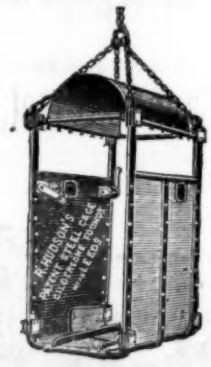
3.—PATENT TRIPLE-CENTRE STEEL SIDE TIP WAGONS.

9.—PATENT STEEL ALL-ROUND TIP WAGON.



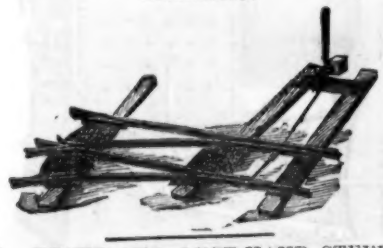
14.—SELF-RIGHTING STEEL TIP BUCKET.
(The "CATCH" can also be made SELF ACTING if desired.)

15.—STEEL CAGE.



4.–PATENT STEEL PLATFORM OR SUGAR CANE WAGON.

10.—LEFT-HAND STEEL POINT AND CROSSING.



5.—PATENT STEEL CASK.
As supplied to H.M. War Office for the late war in Egypt).
DOUBLE the STRENGTH of ordinary Casks without any INCREASE in weight.
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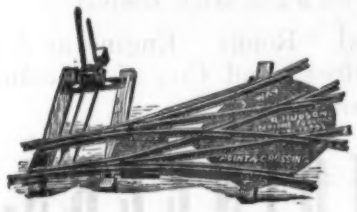

16.—PATENT STEEL WHEELBARROWS.
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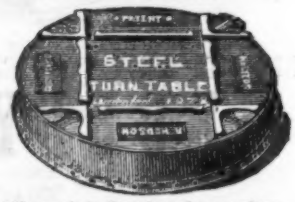

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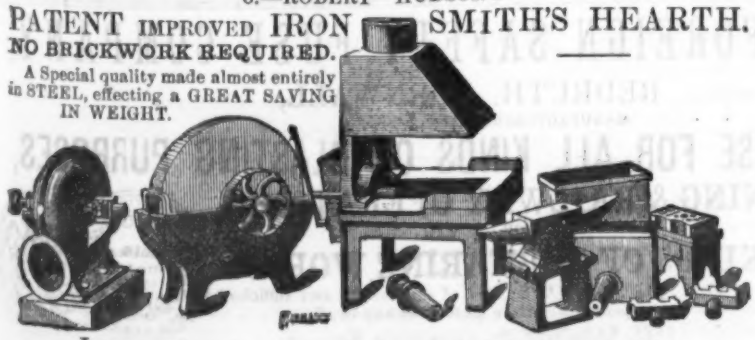

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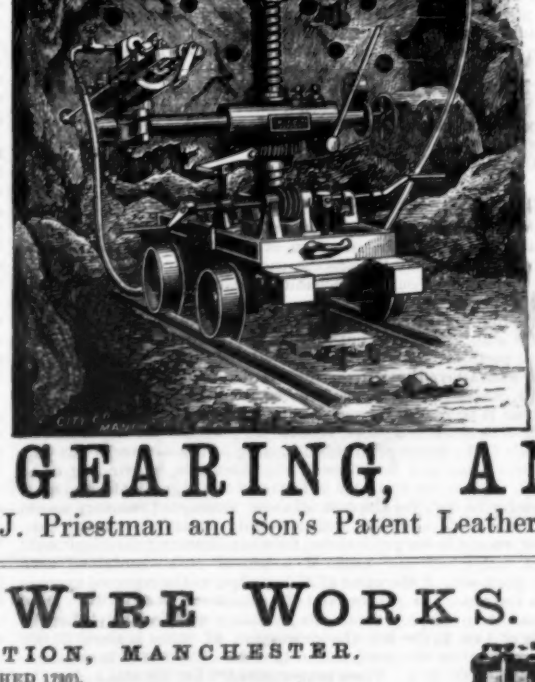

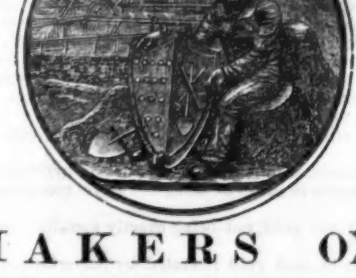

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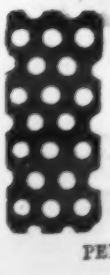

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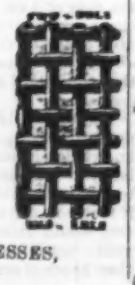
EXTRA STRONG PERFORATED ZINC AND COPPER RIDDLES AND SIEVES.



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Original Correspondence.

GOLD IN WALES (TAILINGS)—No. LI.

SIR,—The word "tailings" is usually treated in shuttlecock fashion, and tossed about at will as if of little or no importance to anybody. In farming, as everybody knows, the expression is understood to mean the chaff or lighter portions of thrashed-out corn after winnowing. In ore-dressing, on the contrary, it generally means the heavy metallic minerals concentrated by some kind of mechanical contrivance, the gangue or matrix of which being of lower specific gravity having been washed from it. This far all are agreed. Tailings are said to be tailings all the world over, without special reference to their material, and when an eye-test is brought to bear upon them they usually pass muster as mixtures of more or less finely reduced galena, copper pyrites blende, and iron pyrites of various kinds, and of little else.

But, tailings really run into mineralogical and metallurgical depths might very much further than this, prove themselves often to be of no remarkable respectability, and demand treatment accordingly. Every atom of the concentrates (as tailings are called by some) probably has a very remote origin, although there are others, heterodox, who think this not necessarily so in all instances, and that a good many of the mineral combinations have their origin wholly or partially in a period not long, if at all, anterior to ourselves. This is my own belief. However, whether fact or not does not matter in the least just now.

Mineral combinations, as is well known, are numbered by the thousand, and a scientist manifests his unwisdom in attempting a display of very great knowledge thereof, even of their physical characteristics only. Chemically they are shamefully little known of, and if it is to me an everyday enigma why, at that matchless Natural History Museum at South Kensington there is no laboratory for mineral analysis worthy of the nation to which all doubtful mineralogies could be referred, and disputed points of national importance be determined. Such an institution needs not involve any expense to the country. It would be more than self-supporting without stingy remuneration to the chemists employed. In passing I may say that I have visited nearly all the museums in Europe, and that I never enter this beautiful building in the Cromwell-road without a feeling of patriotic pride, and sincere respect for the talented individuals who have the charge of it, for there is nothing of the kind worthy for a moment of being put in comparison with it, in any respect whatever. It was empty only about 30 months ago! Let any honest-minded man spend a day in it, and measure up, if he can, the immensity of work involved in bringing it to its present admirable condition. The meritorious exertion of the officials is above all praise, and it would be a graceful act of the Legislature, presently, to recognise this palpable fact by permanently increasing their remuneration. Nobody would grudge it, but the very contrary.

The mineral department, of course, I think literally, the groundwork of everything else. The exquisite and varied beauties there displayed never fail to charm the eye, and quicken thought and reasoning about their usefulness to mankind in general. It is impossible for mental enquiry not to reach out into a thousand and one considerations as to form, structure, composition, modes of occurrence, getting, using, &c., winding up with another thought that if they were smashed and made tailings of, who is there who would undertake to make a complete analysis thereof?

In early boyhood I very well recollect being provokingly kept at noon from an agreed-on match at rounders, because I had not, within the prescribed time, learnt by heart, amongst other wonderful facts, that the four elements were earth, air, fire, and water, as per the first book of useful knowledge. That is not so very long ago, but since then chemists have made out somewhere about three score and six elementary substances; probably many more may be recognisable in the immediate future, earth, air, fire, and water not being amongst them.

Well, of these 66 elements a good many more are present than is generally thought in what are glibly called the tailings from an ore-mill. My own experience has not been vast, but it has been particular, chiefly with tailings resulting from milling and amalgamating treatment of lodestuff from the oldest rocks of Merionetshire, and during a long period of captivating examinations, the following elementary substances have been detected:—Antimony, arsenic, bismuth, cadmium, chromium, cobalt, copper, gold, iron, iridium, lead, lithium, magnesium, manganese, molybdenum, nickel, selenium, silver, sulphur, tellurium, titanium, tungsten, yttrium, and zinc. This being so, and the accumulated matters in varying states of known combination and association, and I will boldly assert, in states of being totally unknown as yet to chemical research, it is utterly useless to think or speak of such accumulations as if they were thoroughly understood, and could be dealt with readily. The chemists, possibly, have yet to be born who will have the talent and courage for dealing thoroughly with well nigh the whole range of elementary substances that are to be found in masses of hitherto despised tailings. The following I believe to be facts:—

1.—That gold exists in nearly all pyritous minerals, both free and in combination.

2.—That embryonic or immatured gold exists in pyritous minerals.

3.—That gold exists in states of being not as yet recognised by the chemists.

4.—That embryonic gold, not being exactly metallic, quicksilver will not dissolve it.

5.—That free gold, and gold liberated by pulverisation, is often tarnished in various ways, so that quicksilver in effect refuses affinity for it.

6.—That the tarnish on free gold is not always rust, as of iron. It is very often tarnished or filmed over by titanic acid, &c., and by infinitely fine particles of pyritous matter.

7.—That no merely mechanical means with the aid of ordinary quicksilver can extract all the contained gold, free and otherwise, from pyritous minerals, especially if they happen to be arsenical in a high degree.

8.—That unless quicksilver can have its affinity, so to speak, largely increased, so that the gold whether tarnished or in combination with arsenic, &c., can be caught as well as the free and untarnished gold, obviously a considerable loss of gold must ensue in all amalgamating operations for its extraction.

9.—That quicksilver can be treated so as largely to increase its affinity for gold in conditions other than untarnished, &c., and gold of inferior quality obtained by its means when ordinary quicksilver would not touch it.

Native gold is found, argentiferous, bismuthic, cupriferous, mercuriferous, platiniferous, stanniferous, holding also palladium, rhodium, and tellurium. It is almost certain that it exists as an arsenide, and very probably as a sulphide, and a silicate. Now, as to these gold states being in contact with quicksilver, who is to tell precisely, by which and how *argentum vivum* gets deranged, as it often does, with the consequent loss of gold, sometimes, as we are told, to the extent of 50 per cent., and more? He is bold who undertakes to get the ultimate particle of gold out of anything by amalgamation with commercial quicksilver, or distilled over so perfectly, and he will not do it. It is beyond him, certainly. He is equally daring who essays the getting of the ultimate particle by any kind of prepared mercury.

But it is quite within the bounds of reason to suppose it possible so to prepare mercury that it has not only far less tendency to derangement when minerals unfriendly to amalgamation are introduced to it; but also an increased affinity for catching and securing gold in various states that would otherwise most likely escape. But, here again, the ultimate particle should not be expected, for it can never be had.

I am induced to write to-day in consequence of reading in the Journal last Saturday of "The Mountain of Gold in Queensland." The communication is extremely interesting from beginning to its ending, and can scarcely escape varied criticism. The narrative is remarkable in several respects:—

1.—The mode of gold occurrence is, I think, new to mineralogical science.

2.—Its supposed origin is not of present importance, and may remain an open question.

3.—The large quantity of gold found may be accepted without question.

4.—The quality of the free gold found, and that it contains not a trace of silver is extraordinary, no doubt.

5.—The retorted gold, also, goes beyond ordinary experience, I think, as to purity, assaying, it is said, 99·7 per cent., with only traces of iron and copper, and worth 84s. 8d. the ounce.

6.—In that the operation of gold extraction employed, one-half of the free gold escaped and was found in the tailings.

7.—That 458 lbs. of ferruginous quartz (without sulphides, &c.) should yield 7·41 ozs. of gold, and that 174 lbs. should give 12·12 ozs., does not at all surprise me, as I have on occasions got more than that; but that its purity should equal 99·5 and 998·2 does surprise me very much. That the mixed tailings of the above per same treatment should yield only 1·66 ozs. of gold, assaying only ·981 surprises me much more.

That the 476 lbs. of dried tailings, in which no gold was discoverable under a microscope, I can hardly think of as fact, unless the assay product of 41½ ozs. per ton resulted from unmatured gold held hidden in pyritous matter, and non-amalgamable. That 8 ozs. 17 dwts. 3 grs. of gold might be held in 476 lbs. of pyrites I can believe, because I have myself obtained at the rate of 25 per cent. of gold from arsenical pyrites in Merionethshire. In its natural state, however, my gold was always alloyed with about 15 per cent. of silver.

8.—The reason assigned in the report is the supposed coating of the gold with iron oxide, so that the quicksilver used would not touch it.

9.—The absence of all description of the tailings, and the percentage.

10.—The conclusion arrived at—that a chlorination process is the *sine qua non* for the treatment of such ores.

Probably a chlorination process may be advisable for the treatment of most auriferous tailings, but for various solid reasons all who can most certainly will use some sort of amalgamation process; and, as I have often said, that is the best process which gets the most gold in the least time and at the least cost. The experiment above referred to appears to have been badly made with a bad method. There are dozens of plans far better than the one used. The statement, it is true, is wanting in sundry important particulars, and it appears to have been compiled for the purpose of advocating a mode of gold extraction, which, when practicable, requires no laboured advocacy.—*London, Sept.* 2. T. A. READWIN, F.G.S.

ANGLO-NORWEGIAN MINING ENTERPRISE.

SIR,—Soon after my letter to the *Mining Journal* of June 28, respecting the Oscar Gold Mine, the shares rapidly advanced, insomuch that they were quoted about 200 per cent. premium, and then relapsed to a little above par. These erratic movements set afoot naturally many enquiries as to the causes at work, especially as regards the relapse. The reason is simple and obvious, and had nothing to do with the status at the mine. There was a strong demand for Oscar shares so soon as the lists were closed, and buyers had to seek in the open market. Many orders came, and do still come, from Norway, in addition to the London and country demands. Holders did not wish to sell, most of them being men of means who wished to see the enterprise through. In the absence of sellers, and anxiety of buyers, the price naturally advanced so rapidly, in fact, and so much that buyers withdrew from the market. Subsequently a few sellers turned up, and pressing their shares the price naturally dropped back again. There was no cause at the mine to enhance or depress the values so materially. Those in charge at Oscar have pursued the even tenor of their way, pushing mining and mechanical operations, having in view the promise that crushing ore was to commence by the middle of this month of September if possible. This desirable consummation is about to be realised, and the result is awaited with considerable interest. There is no question raised about there being gold in Oscar Mine, and more than the early projectors ever dreamed of, as proved by subsequent discovery of some 12 more lodes, all showing gold.

The real question now to be solved is what will it cost to produce the first thousand (1000) ounces of gold? We have heard a great deal about probabilities in the many gold mines that have been launched in London; but the public is looking for results, actual cost, and actual returns. In Oscar this problem is to be solved in a very short time. The best informed feel confident of the result, and cling to their shares with tenacity. The disappointed ones, who did not get in to their satisfaction, growl naturally, and loudly. Men always have, and always will quarrel over gold. There has been some quarrelling over Oscar (if there was no value in Oscar there would have been no quarrelling), and some of the discontented have thrown over what few shares they had in the hope of breaking down the price; but they are dissappointed again, and their shares have been all picked up and salted away. As you are well aware, Sir, pique has a good deal to do with price at times. The reduction officer, a gentleman selected with great care and circumspection, is at his post on the mine. The heap of ore awating treatment by the stamps is fenced in from public gaze and peculations, and in sinking the Oscar shaft deeper gold has been and is found in quantities far beyond the expectation of Capt. Daw, jun., as expressed in his last letter, just received. No one knows the value of Oscar at present. If the treatment of the ores realise a portion of the expectations of those who know most about it shares will again be sought for. A short time will now reveal the (at present) hidden treasures of the pile of ore at surface. Those who win must take a certain amount of risk in every enterprise. When a thing is demonstrated it is too late; correct forecasts make fortunes, and it must be admitted that it does not require much nerve, and very little money at present to make the trial.—*Peterborough, Sept.* 2. F. H.

THE AMALGAMATION OF GOLD AND QUICKSILVER.

SIR,—The importance of a clear understanding of the above subject makes me request the insertion of this letter. I think I stand alone in believing that the process can only be commercially profitable when carried out by mechanical means, and when pure quicksilver is alone used.

Gold is found in three conditions—pure, in combination with silver (its chief alloy), or pure, but covered or coated over, even in its minutest particles, with an oxide or sulphide of iron or copper. If pure, or even alloyed with silver, there is no difficulty in its amalgamation with quicksilver; but when coated as named above the question is how can it be rendered capable of amalgamation at the least cost, and can it be done at a profit, because all processes are dependent on this result? To accomplish this cleansing of the surface of the particles three plans may be followed—by chemicals, by grinding, or by attrition. When the first plan is followed the ingredients used must of necessity be lost, for the cost of their attempted recovery would exceed their value, and their first cost would certainly be greater than the gold, except in very rich stone, for what cleansing chemical could be used with effect and profit if a ton of stone contained even 1 oz. of gold, say, of the value of 3*l.* 15*s.*; but as the reported average yield is less than ½ oz. per ton, and often does not exceed 5 dwts., how is it possible to employ chemicals profitably or effectively when, in the case of 1 oz. to the ton the proportion of stone is about 27,000 times greater than the gold, and in the case of 5 dwts. it is considerably over 100,000 to 1. These proportions are for dry stone; but the quantity of water employed in the crushing would, of course, reduce the strength of any acid employed to such a degree that it would be useless.

The second plan named is by grinding or rubbing; but here the same proportions of gold and stone being granted, very little mechanical knowledge is necessary to prove how much is ground or rubbed uselessly in comparison with the gold, and even then there is no guarantee that the gold is touched by the grinding or rubbing process; and if it is not, the labour must be in vain and the expense thrown away. One would think that stamps would not be bad for cleansing the gold; but in the workings at Conrad Hill it was found that no less than 2½ ozs. of amalgam was found in my amalgamator that had passed the three copper plates on which the pulp first came from the stamps. As the amalgam on the plates was 4 ozs., the saving by the amalgamator was no less than 62 per cent., for without the amalgamator this would have been lost. This was due to attrition only. I have thus, I think, made plain that attrition, as proved at Conrad Hill, is the only profitable plan of rendering gold ready for amalgamation with quicksilver.

I have always held the idea that the saving of gold from its matrix should be done by the simplest means, and by the least expensive processes. All my efforts have been, and ever will be, directed to the accomplishment of this end. I thank you for giving me the opportunity of expressing my views on this important subject.

Wharf-road, Sept. 4. HENRY MOON, M.E.

SPECULATION ON THE FORMATION OF METALLIC LODES.

SIR,—How frequently it is seen that people meddle with matters which are beyond their comprehension, or which they do not understand. Every class of man, excepting the experienced miner, be he who he may or what he may, assumes the character of a miner, and writes to you on mining and mining phenomena as though he were an authority and guide for all the world. In last week's Journal you allude to a new book entitled the "Gazetteer of Cornwall." From the description given of this book, and from the many full and lengthy extracts which you have given from it relative to the formation of metallic veins, it appears to me to be but a theoretical repetition of what, on the same subject, has been already so repeatedly written, and has become so stale, that it clogs both the ear and the mind. The late respected Mr. Robert Were Fox, of Falmouth, an exceedingly clever man, and considered one of the greatest geologists in England, spent 40 years of his valuable life speculating on this, the most abstruse of all subjects, and died with no more light on it than he possessed when he began to speculate. There have been two favourite theories, the one called the aqueous and the other the igneous theory; the one that water charged with metallic substances held in solution and passing or percolating through the surrounding or encasing rock is conducted into fissures which it fills up, and thus form metallic veins by precipitation; although it is a known fact that sometimes with a continuous lode we have sterile pieces of even scores of yards in length between the ore that has been left behind and that which is before—between bunches. The other theory—igneous—is, I believe, that vapour ascending from the centre of the earth finds its way into the already-prepared fissure, and there becoming condensed, forms the metallic veins.

As to which of these two theories is the more plausible I do not pretend to advance an opinion; but, in practice, it seems to me that neither of them is admissible. But supposing, for argument sake, that the metallic particles were held in solution either in the water or in the vapour, it must pretty plainly appear that at one and the same it held in solution different kinds of metal—tin and copper—and of its own accord to have divided the particles, those of tin from those of copper, before it deposited them in the fissure; for, although the ore of tin and that of copper are usually near neighbours, yet are they never blended together. They are both found in the same lode, but quite separate the one from the other. There is a perfect division, so that the one can be extracted entirely independent of the other—a most skilful arrangement for either water or vapour to effect. I say that both the ores of tin and of copper are found in one and the same lode, but never, I believe, incorporated together, as is the case with lead and silver. The same is it with cinnabar and lead as with tin and copper. They are found together in the same lode, and in the closest possible proximity to each other, but not blended together; there is a perfectly natural division between them. But to revert to the igneous theory. For example, a mine next the surface has been worked for tin, which held to a certain depth, at which it ceased and gave place to copper, which, after a certain further depth, in its turn failed, or ceased to exist, and tin succeeded: then, according to the theory, the vapour ascending from the deeper and hotter regions must have come up through the solid adamantine rock, laden with particles of both tin and copper, and must have most skilfully deposited them in immense layers. First tin, then copper, then tin again; and, for aught that is known, further alternations in increased depth may yet take place. As to fissures, which are chasms having been filled up for the formation of veins, the idea is too absurd to entertain, and the studious, thoughtful, practical miner who explores the bowels of the earth witnesses sufficient phenomena to convince him that such a thing never could have been. The formation of metallic veins was the work of the Creator; it is one of the secret things which belong to the Lord our God, and which, with even the shadow of a certainty, will never be revealed by man. But supposing that it could be revealed, of what practical utility would it be?

As to those gentlemen who are practical geologists, with all due respect to them, they are not the men to be consulted on matters of mining. Mining is not in their province. One of them (a gentleman who has not long since been taken from amongst us, who was accounted one of the greatest of geologists, and was thought to be a great mining authority, and who was frequently called upon to inspect and report upon mines) said to me when I travelled with him on the continent of Europe—"If anyone has a mind to employ me as a mining engineer am I to say that I know nothing at all about it?" Ah! these are not the men to write or speak on mining or on mining phenomena; rather take the practised miner, who has long explored and laid open the interior of the earth, who could tell you whether or not a certain kind of ground was capable of producing any kind of metal at all, and if so, of what kind. This an experienced miner can and will do. This is the man, and the only man, who should attempt to write or speak on mining, the most obscure and abstruse of subjects, and on which nothing but long practical experience will guide aright.

Referring to the remaining mining capabilities of Cornwall I do not say that it is impossible that good mines may yet be found. As to copper mining there it has, at present, almost come to an end, and where to fix upon a spot at which there is a probability that a good copper mine can be opened is not an easy matter, and I see no chance of Cornwall ever becoming, as a mining county, what it has been. There is a ridge or channel of granite, accompanied at a less or greater depth by clay-slate. This ridge is locally termed the backbone of the county; it runs all through it and into Devon; and adjacent to this have been worked the mines which rendered Cornwall famous as a mining county; but in the parish of Gwennap, to which you alluded, and where all the richest copper mines were situated, the mines were worked to a great depth, became poor, and have long ago been abandoned.

Wherever any mining has been tried, a mile or two on either side of the channel of granite it has proved a failure; and it is for this reason that I, say let your correspondents tell you what they may, there is but faint hope that Cornwall, as a mining county, will ever be what it has been, and that is doubtless, the richest mining county in England. The geologists having explained why cross-courses are sterile, should also explain why they are sometimes rich. I have seen a large branch of the richest of copper ore in a cross-course. Your correspondent, in writing on the gold of the Morgan Mountain, in Queensland, says—"Lock says, in his work on Gold, published in 1882, 'No gold has yet been found in nature unalloyed with silver.'" I do not know Mr. Lock, but, in his assertion, he surely errs. I myself was employed for five years in the richest gold mines in the world, and I never understood that ever a particle of silver was found in the gold, neither did I ever understand that any silver has been found in the gold of St. John del Rey, one of the oldest and richest gold mines in the world.—*London, Sept.* 4. JOHN LEAN.

ANGLO-AMERICAN MINE MANAGEMENT.

SIR,—The directors of a certain company have again advertised in the *Mining Journal* for a mine captain for two of their mines. This change of front is somewhat puzzling to outside shareholders and others, inasmuch as a few weeks since a "Manager" was sought for, and it is within my knowledge that several applications were sent in, and at least one of the applicants fulfilled all requirements, and attended before the board, producing the highest testimonials as to character, long experience, and ability. It is a point in the history

of what may yet prove a "bubble" concern (as to its promotion and management, perhaps, more than to its merits as a mine) not to be soon forgotten; and some are curious to know what influences are at work to throw over the appointment of a capable and independent manager in favour of a mere agent, who presumably will be instructed and managed by some on the board and out of it, who have their own interests to serve. It may not be out of place to add that the whole doings of the board and the promoters are being keenly watched, and will from time to time be the subject of comment by those fully acquainted with the whole matter. J. N.

Chacewater, Sept. 2.

GOLD MINING, AND ITS MANAGEMENT.

SIR,—I see by a report of the El Callao Gold Mine, Guyana, Venezuela, which is pronounced the richest gold mine in the world, that the production of gold "from 1871 to 1883 inclusive, was 618,389 ozs. of gold, representing an approximate value of 2,381,550*l.*, and the company have distributed dividends during the same period amounting to 817,880*l.* sterling, augmenting at the same time the reserve fund to 40,000*l.*" The general average result of the yields per ton is only given from 1879 to 1883, which shows a magnificent average of from 4 to 5 ozs. per ton. With such a high average yield of gold per ton, and the enormous amount of gold produced, the rate of dividends appear to be very low, being only about one-third of the gross yield. It is stated to be "a marvellous result, arising from perseverance and good administration of the mine."

That may be a matter of opinion, but I am at a loss to perceive where the good management of a mine is, where the quartz averaging (say) from 3 to 5 ozs. per ton that only pays one-third of the product in dividends, while over 2 ozs. per ton goes for expenses of working and management. What would the dividends have been had the quartz only averaged 1 to 2 oz. per ton, which would be considered a very high yield with most mining managers in the United States of America or Australia.

It is no sign of good management to pay dividends from a rich mine, anyone can do that. Where the evidence of good mining management comes in is in paying handsome profits from low grade ores. Contrast the difference of management between the El Callao Mine and some in America or Australia. Thus take the mines at the Black Hills, Dakota, in a few years they have mined and milled 1,512,037 tons of ore averaging only $5·78 per ton; total product, $10,434,116, and paid in dividends $3,142,500, or nearly one-third of the entire gross yield. Or take a mine like the New North Clunes Company, Victoria, which while working at depths from 600 ft. to 1000 ft., where the yields averaged about 10 dwts. per ton used to pay about 50 per cent. of the production in dividends; or take the entire output of quartz in Victoria for the year 1882, as given at 1,027,826 tons, which averaged only 9 dwts. The dividends paid amount to about one-third of the product. Or take a single mine like the Black Horse United Company in the Ballarat district, where on an average of only a little over 3 dwts. per ton they paid in dividends for the half-year 3250*l.*, or nearly one-fourth of the gross production.

I am aware of the difficulties and extra expense of working gold mines in hot climates, with bad roads, high wages, and expensive machinery to procure and erect, and all the other attendant obstacles to progress that occur, but I can scarcely perceive that there is anything to boast of in the management of the El Callao Mine where only a little over one-third of the product is paid in dividends from such a magnificent and I may say extraordinary yield of gold.

A great amount of kudos is oftentimes given to the management of gold mines that pay dividends from high grade ores, while little note is taken of the waste and extravagance going on, which in the hands of more economical parties would pay much better. The highest credit in mining management is to those who can and do work poor mines with profits. The mere fact of quartz being exceptionally rich in any particular mine is a matter of chance and fortune to the possessors, but it does not follow that the management is the best. ECHO.

AMERICAN TIN AND COPPER.

SIR,—After reading the statements which have recently appeared respecting the great discovery of tin in the United States it may interest some readers of the *Mining Journal* to know what the Americans themselves say about this discovery. I, therefore, subjoin from the New York Semi-Weekly Journal of Commerce, a leading article on this subject; it also throws some light on the United States Protection tariff, and is worth reprinting in your next.

The tin mine owners in Dakota and North Carolina continue, says the Journal of Commerce, to relieve their feelings through some of the papers. They are surprised that capital does not respond to the alluring statements of the boundless wealth of the new tin mines. To be sure this wealth is at present invisible. But we are told that it only awaits the shovel and pick. It is safe enough underground, not having been displaced or disturbed by the late earthquake, which did not affect either North Carolina or Dakota. It will take more than an earthquake to shake the scepticism out of capitalists where mines of any kind are concerned. When these mines purport to be tin, the tax upon credulity is the greatest of all. For tin is the one metal which has hitherto proved to be absent from this country in paying quantities. It has been the subject of much prospecting and disappointment. The specimens of tin ore discovered in the United States are, like other rare minerals, interesting as cabinet curiosities We are now asked to believe that tin abounds in two places in this country. If we doubt this assertion we have only to pay somebody else for digging it out. This condition of the demonstration is respectfully but firmly declined.

The owners of these tin mines are publishing statistics to show how much this country depends on foreigners for tin. They quote the official figures for the fiscal year ended June 30, 1883. These give the imports of tin in bars, blocks, and pigs at $6,106,250, and of tin in manufactured form at $17,811,587—total, $23,917,837. The manufacturers of tin are dutiable. The crude tin is free. It is free because it is not produced in this country. This is the only reason. If an American tin mine could be made to yield anything more than cabinet specimens of the metal the owners would demand a stiff protective duty on foreign tin. Tin mining would then be the latest and most helpless of infant industries, and (according to protection theorists) entitled to the most liberal allowance of tariff pap. This was the plea used to obtain a protective duty on crude copper in 1846. Up to that date copper in pigs, bars, and ingots had been on the free list. The Lake Superior copper mines were opened on a working scale in 1845. The new-born industry required protection and received it the following year, when a duty of 5 c. per pound was levied on crude copper. Afterward, in a spasm of tariff reform, Congress reduced this duty to 2½ c. per pound, but the Lake Superior copper men succeeded in restoring it to 5, where it stood for many years. It is now 4 cents., which serves the purpose. The Calumet and Hecla is probably the greatest copper mine in the world. It long ago ceased to be an "infant," but the protective duty is still retained. This country now exports copper, and our protective friends are in the habit of pointing to the Lake Superior mines as crowning evidences of the wisdom of their policy. The proof would be still more convincing if the duty on crude copper were repealed. The pinch may not be felt while the Calumet and Hecla Mine continues so productive that copper has been forced down to 14 c. per pound by the excess of its supply. But there are whisperings that the wonderful mine is slowly "petering out," and in consequence its shares have greatly declined. Suppose these rumours true, and that in a few years we should become again dependent on the foreign supply, then the duty of 4 c. per pound would be a more appreciable burden. Probably the Lake Superior copper interest would seek relief in another increase of the duty.

It may be very desirable from the American miners' point of view that block tin should be made dutiable. If this were done the capital which is now so coy might be more easily coaxed to invest in tin mines. But it is for the interest of the public that block tin should be kept on the free list. If the working of a little tin mine somewhere in this country for the benefit of a few persons should have the effect of increasing the tariff burden that particular development of enterprise could not be regarded (save by our enthusiastic protection friends) as a national blessing. A. C. P.

Bristol, Aug. 30.

FIELD FOR ENTERPRISE IN NEW MEXICO.

SIR,—At no time in the history of New Mexico has its mining interests been in such a depressed condition as they are at the present time. This is not owing in any degree to a failure in the intrinsic value of the mines themselves, but is owing in part to the general commercial depression through the country, and in part to the uncertainty as to which party will win in the coming Presidential contest, and the consequent policy on the tariff question. Apart from these, however, there is another important reason for the present stagnant state of mining matters, and it is this—investors, attracted by the enormous profits realised from the cattle business, are investing largely in ranches and cattle. Now, while it is true that these profits are very large, ranging as they do, under proper management, from 25 to 30 per cent.; yet, judging from some of the companies that are being put forward, investors cannot be too careful in thoroughly investigating before they invest. Parties may claim that they have range for a large herd of cattle, while actually they may not possess a perfect title to more than a few hundred acres.

The usual practice is to acquire by home-steading or pre-empting a water-right controlling more or less grazing ground in the rear. To this grazing ground they have no title except that of possession, and while it is a generally recognised custom among ranch men not to infringe on one another's range, yet there is no legal ground to prevent them. On the other hand, confirmed grants with perfectly good and solid titles are to be had, and these invariably contain the best watered and grazing grounds of that part of the territory in which they are situated. These can be obtained at present at prices ranging from $1½ to $2 per acre. Where investors have sufficient capital, these grants are by far the best investments, especially when these investors are aliens; as, while as aliens, they can purchase and hold any amount of land as mere occupiers, they are liable to be dispossessed at any time. That the Territory of New Mexico is peculiarly adapted to this business is an admitted fact.

The mildness of its climate, and the consequent utter absence of any necessity to make any provision for winter feeding reduces the losses to a minimum. Where due care is observed these losses need not exceed from ½ to 1 per cent. An additional advantage in this territory is the fact that shipping points and stockyards are located at all suitable points on the railroad, and easy access to the leading cattle markets is thus assured. Large ranches can also now be secured in Old Mexico, ranging from a few thousands to many hundreds of thousands of acres, and at from 25 cents. to $1 an acre, with perfectly good and valid titles. But here, as in the case of New Mexico, reasonable care must be taken to avoid bad investments.

JOHN ROBERTSON, C.E., M.E.

Las Vegas, New Mexico, Aug. 12.

INSTANTANEOUS BLASTING WITHOUT ELECTRICITY.

SIR,—Having been very much interested in the letters appearing in the Journal, on Bickford, Smith, and Co.'s Instantaneous Fuses, I shall be glad if you can find space for the little information to be added to them. In this district, Aberdeenshire, they were introduced very shortly after they were brought out in June, 1880, and have been in use since. Most of the quarry-owners now use them to a very large extent in blasting the well-known Aberdeenshire granite. For this work they have been found most suitable, from the ease with which the firemen can handle them, and from the large amount of rock brought out in large and sound blocks. Unlike battery work, they can be used in any state of the atmosphere, and manipulated by one man without any attendants. The number of holes presenting no obstacle to instantaneous blasting, and the certainty of ignition being greater than with the divided electric current. The greatest test of their usefulness is the confidence the firemen have in using them, and in the number of large blasts made by these fuses. I have not heard of one failure during all this time, and that is saying a great deal in their favour.

Your correspondent "C.," of Paris, in the *Mining Journal* of June 28, asks as to the relative cost of these fuses as against battery work. There is no expensive detonator required for each hole, neither is there a certain amount of electric wire destroyed at each shot, nor the large first cost of battery and cable; the cost of these fuses being at once known by the price per yard, and one ignitor for the whole number of holes to be exploded. J. C.

Aberdeen, Aug. 28.

MINING DEPRESSION.

SIR,—It is much to be regretted, on many accounts, that an industry which, judiciously conducted, pays so well should be in so depressed a condition as that now existing in Cornwall. People go from one extreme to another. In 1881 they were too eager to invest in mines, catching at anything presented to them that had a high colouring, without taking pains to investigate its merits; and so, being disappointed, they have gone to the other extreme of investing in nothing. Never in my long life have I witnessed a worse state than the present in regard to investment. However promising a mine may be, however certain of early returns, people look on with indifference. Capitalists are spasmodic. If there are any convalescent speculators I would remind them that at Wheal Singer, near Wheal Vor, the returns of tinstone supply satisfactory evidence of its intrinsic worth. I believe that the mine has been worked up to this time by one gentleman alone. R. SYMONS.

Truro, Sept. 4.

TANKERVILLE MINES SUSPENSION.

SIR,—I see in the report of the committee formed in Shrewsbury for the relief of the miners this statement:—"The men have allowed their wages to be two months in arrear, and have never availed themselves of the power given under the Liability Act of inspecting the books of the company to see what money is in hand for wages. They would probably be afraid to do this. Now, I believe that the neglect has been through ignorance." If any of these gentlemen or your correspondents will tell us how to proceed in this matter we shall be thankful. They have paid 5*s.* in 1*l.*, and it would be doing us a great kindness if we could be informed how we may recover our rights. I have been told that, according to the Act all wages should be paid in full.—*Birmingham, Sept. 7.* E. H.

TREBARTHA LEMARNE MINE.

SIR,—I visited this mine last week with several others, and in my opinion it is, without exception, the best young mine in the county. It should have been a dividend mine two years ago. The No. 1, or north lode, has been driven on scores of fathoms in the deep adit, and I have seen samples brought here from the lode, which has proved by assay to be worth over 14 cwts. of tin to the ton of stuff. There has been a shaft sunk 10 fathoms below the deep adit, and a level driven west 11 fathoms; lode 4 ft. wide, richer than it is in the adit, and not one penny's worth ever been sold from the lode yet. Some 60 fathoms west of engine-shaft is a drawing-shaft to the deep adit, a large quantity of the lode laying there already broken, and thousands of tons laid open; that is, what is to be seen where the shaft referred to went down on the lode, the drivage in the adit, and the lode to be seen in the bottom level. There is another lode south called the Gulley lode; they have been working for some time on some branches and returned 9 tons of tin from them, and got about 2 tons more ready for market. But they have now discovered the main part of the lode was south of them, where it is found very good for tin. I saw large stones broke, half tin; they had commenced to close drive, and as the end is 4 ft. wide they had not seen the foot or north wall. JNO. BUCKINGHAM.

Callington, Aug. 30.

SILVER HILL TUNNEL.

SIR,—Mr. Pool, who bought this mine out of the Stannaries Court has commenced working it, I hope with more success than the former parties had. Mr. Pool is not going to drive the tunnel I understand at present, but is working on one of the copper lodes that the tunnel went through. I have seen some of the ore broken this week from the lode, which is of high percentage.

Callington, Aug. 30. JNO. BUCKINGHAM.

NEW HOLMBUSH MINE.

SIR,—I can congratulate the shareholders that they have cut three very good points opening up for copper and arsenical mundic and one for lead. They are driving three ends with Stephen's Climax rock drills, which proved to be the fastest at the Falmouth trials a fortnight since, so there is no doubt they will soon get in far enough to enable the backs to be stoped behind the ends, when they will greatly increase their returns, which they richly deserve for their patience and outlay. JNO. BUCKINGHAM.

Callington, Aug. 30.

FOREIGN MINING AND METALLURGY.

The Coal Trade has continued in a dull and sluggish state in Belgium. The state of affairs is precarious in almost all the Belgian coal districts, except, perhaps, in the Couchant de Mons, where there has been a fair enquiry for household coal. It is believed in this last mentioned district that the current month will bring with it a rise of at least 10d. per ton in prices. Coke has been held without much firmness at 12s. 5d. per ton. The number of trucks carrying coal and coke which passed over the Belgian State Railways in the week ending Aug. 24 was 16,723, as compared with 17,508 in the corresponding week of 1883, showing a decrease of 785. The production of coal in Belgium in the first half of this year is officially returned at 9,010,695 tons, as compared with 9,006,443 tons in the corresponding period of 1883. The general condition of the German coal trade has shown no material change. There has, however, been a certain check in business in Silesia. The movement of German coal to Italy in July amounted to 5160 tons, as compared with 5360 tons in July, 1884. The coal trade has shown little animation at Paris; business in coal has also been inactive in the North of France.

Prices have continued sadly low in the French Iron Trade, but this is not due to an absolute want of orders; on the contrary, a certain activity prevails in merchants' warehouses, and the forges are far from being idle. The prevailing characteristics of the situation are, indeed, a relative activity in business, and a continued fall in prices. Merchants' iron has been feebly supported at Paris at 42*l.* per ton. A state of affairs so difficult as the present cannot continue much longer without involving the stoppage of certain rolling-mills, and it is tolerably evident that many works will not be able to continue the struggle. The Nancy and Longwy group has decided to proportion its production to the requirements of industry. Old iron rails have been in little demand, and have not been carried beyond 3*l.* 12s. per ton. In the department of the Nord the state of metallurgical affairs has experienced scarcely any improvement. Orders have continued scarce, and some of the principal industrial establishments have only been working 18 or 20 days per month. The specialities alone have plenty of employment assured to them. The rolling-mills and foundries are suffering the most from the effects of the crisis.

It is not possible at present to report any important change in the Belgian Iron Trade. An adjudication of 100 trucks for the Belgian State Railways is announced for next week; very low tenders will probably be submitted in connection with this affair. Many industrials appear to consider that the only effectual remedy for the existing depression is a serious reduction in the production, which, in the case of some articles, would seem to be still increasing. Quotations of pig and manufactured iron have shown little change upon the Belgian markets during the last few days. It is noticeable that the Germans keep their orders at home. The Baume and Morpent Ironworks (a Belgian undertaking) recently submitted tenders at Erfurt for *matériel* required for the German State Railways. There was a considerable difference between the Baume and Morpent tender and the tenders submitted by local German firms; but notwithstanding this, the *matériel* required was ordered from the latter, although a German State engineer who visited the Baume Works some time since appeared to be favourably impressed by what he saw. The Dutch-Indian authorities are about to purchase a quantity of State rails for Dutch-Indian lines.

NOTES ON THE MINERAL PRODUCTIONS OF PORTUGAL.

BY J. H. COLLINS, F.G.S.

The kingdom of Portugal has been in England at least very little considered hitherto as a mining region, although some of its mines were extensively worked during the Roman occupation of the Iberian peninsula, and some of its accumulations of ancient scoria in the districts of Beja and Evora will vie in extent with those in the Spanish Sierra Morena.

An interesting official return which has recently been published serves to show that a remarkable revival of mining industry has taken place in Portugal since the year 1850. In the period immediately preceding that date the annual value of the minerals raised in the whole of the kingdom scarcely reached 10,000*l.*, but between that year and 1880 the total quantity of mineral extracted amounted to 3,594,864 tons, having a value of 4,878,400*l.*, a large sum to be added to the revenues of so small a country. In the return referred to the average yearly production is given for each period of five years, the figures are:—

Period.	Average production yearly. Tons.	Value.	Value per ton.
1851 to 1855 ...	7,419	... £ 12,437	... £1 13 6
1856 to 1860 ...	19,260	... 38,818	... 2 0 3
1861 to 1865 ...	111,799	... 163,764	... 1 9 4
1866 to 1870 ...	157,381	... 250,200	... 1 11 9
1871 to 1875 ...	216,870	... 255,800	... 1 3 7
1876 to 1880 ...	200,244	... 241,320	... 1 4 1

It will be noticed that, except in the period 1876–1880, when there was a slight falling off there has been a steady and remarkable increase during the whole of the period. During the year 1881 no fewer than 345 new mining concessions were granted, having an area of 23,533 hectares, or more than 95 square miles, the concessions being distributed as under, one or more in every one of the 17 districts into which Portugal is divided, except the little district of Minho on the extreme N.W.:—Aveiro, 3003 hectares; Beja, 7481 hectares; Braga, 50 hectares; Braganza, 1903 hectares; Castello Branco, 529 hectares; Coimbra, 390 hectares; Evora, 2149 hectares; Faro, 652 hectares; Guarda, 270 hectares; Leiria, 556 hectares; Lisboa, 2390 hectares; Portalegre, 375 hectares; Porto, 2166 hectares; Santarem, 416 hectares; Villa Real, 467 hectares; Vizcu, 736 hectares = total, 23,533 hectares.

In that year the mines actually at work were:—In Aveiro, 6; Beja, 29; Braganza, 1; Coimbra, 1; Evora, 3; Lisboa, 4; Porto, 1; Vizcu, 2 = total, 54. The total production of these 54 mines was during the same period:—Anthracite, 12,043 tons; bituminous substances, 1504 tons; lignite, 5233 tons; antimony ores, 866 tons; lead ores, 1158 tons; iron ores, 29,257 tons; manganese ores, 9906 tons; copper ores, 4784 tons; cupreous pyrites, 117,191 tons (this had increased to 280,000 tons in 1882 according to R. Wimmer, and the production was still further increased in 1883); not stated, 30,860 tons = 211,942 tons. This production had a total value of 309,360*l.*, thus showing a considerable advance on the production of the years 1876–80 in tonnage, and on 1871–80 in value.

The dues (contribuciones) paid on this production amounted to 6930*l.*, or but little over one-fiftieth, a fact worthy of notice by the landowners of mining properties in England, and especially in Cornwall, where three times as much is frequently demanded from mines which are very deep and expensive to work. The number of people employed amounted to 6273, of whom 5152 were men, 632 women, and 489 children:

On June 30, 1883, there were no fewer than 359 mines actually at work raising ores as stated below:—Antimony, 14; lead and antimony, 3; chrome iron ore, 1; lead, 47; argentiferous lead, 6; copper, 52; copper and iron, 1; zinc, 1; bituminous limestone, 1; coal, 17; coal and iron, 7; graphite, 1; iron, 32; tin, 15; iron and manganese, 38; manganese, 90; gold, 1; remainder not stated.

The mines of Portugal, with a very few exceptions, are but little known to mining speculators in England. They are mostly worked either by small local companies or as private speculations by English capitalists. The chief mines of cupreous pyrites are those of San Domingo and San Joao de Ajustral. The gold district of Rosmaninhal and Alares, in Castello Branco, was described by Mr. H. W. Bristow,

the Mining and Smelting Magazine, Vol. II., 1862; one nugget is id to have been obtained weighing 18 ozs., others of 12, 11, several 2 and 3, and in 1856 one of 3½ ozs., ½ and 7 grains.

The gold sands of the Tagus have long been known and worked. t present the yield of gold from this source is extremely small, and is doubtful whether even with the use of modern appliances enough old could be obtained from these sands to pay expenses.

The following is a list of such Portuguese minerals as have hitherto me under my notice:—Apatite, blende, brochantite, calcite, cassiterite, chalybite, chalcocite, chalcopyrite, chiastolite, claudetite, coal (most of the usual varieties), elaeolite, galena, gold, gypsum, hematite, hornblende, jasper, limonite, magnetite, meerschaum, melanterite, muscovite, niccolite, orthoclase, peganite, pyrites, pyrolusite, quartz, staurolite, sulphur, wollastonite.

MINING IN DERBYSHIRE UNDER THE DERBYSHIRE MINING CUSTOMS AND MINERAL COURTS ACT OF 1854.

No. IV.—By W. Niness, M.E.

Clause XL. of the Act, in reference to the service of subpœna on witnesses, says—Every subpœna issued to attend and give evidence in a small barmote court shall be as valid and effectual in law as if the same had been issued out of the Court of Queen's Bench.

Clause XLI.—Where a plaintiff obtains judgment in an action of debt, and the defendant shall refuse for the space of three days next after the day on which judgment is given, to deliver possession to the plaintiff, it is lawful for the plaintiff to apply to the steward, and the steward shall thereupon issue a warrant, and the barmaster shall forthwith execute such warrant and deliver possession accordingly. And where the defendant omits to pay any debt or damages recovered or awarded to be paid by any judgment in the said court it is lawful for the steward to take possession of any mineral property within the jurisdiction of the barmote court, and sell the same by ticket or by public auction, or so much as may be necessary to raise the sum required. And in case the mineral property is not sufficient to recover the amount or deficiency by action of debt in the county court, if the amount required does not exceed 50*l.*, otherwise in any superior court of Westminster.

Clause XLII.—All warrants issued by the steward shall be in force for one calendar month from the date thereof, and shall be returned by the barmaster to the steward within six weeks from the date thereof, and renewed from time to time till executed.

Clauses XLIII., XLIV., XLV., XLVII., XLVIII.—Respective barmasters every year to make out a list of all, if the number shall not exceed 48, owners or mountainers of miners, not being members of the grand jury for the time being, and fix the same upon or near the outer door of the place where the respective great barmote courts are usually or where last respectively held; and three days before any small barmote court the barmaster shall cause to be summoned 24 persons named in the said list to attend at the time and place appointed for holding the small barmote court, and where there are not a sufficient number of eligible jurymen in the united liberties it is lawful to summon a jury from the list of the other liberties mentioned in this section. List of jurymen open to the inspection of the plaintiff or defendant, jurors to be balloted for, and objections to jurors allowed. Penalty for jurors for non-attendance, unless reasonable excuse be given to the satisfaction of the steward, not exceeding 10*l.*, and lawful for steward to issue warrants for levying thereof, with all costs and charges attending such levying; but if any person shall think himself aggrieved by the imposition of such penalty or the execution of such warrant, the steward may grant him such relief as to the steward may seem just. Parties to the suit can compel by subpœnas the attendance of witnesses, the production of books and deeds, papers and writings in the possession or control.

L.—Barmaster not to be liable for anything done under any writ, &c., nor while acting under any such writ, &c., make him a trespasser *ab initio*, though it be not in obedience or not necessary for obedience to such writ, &c.; but the party committing such last-named act shall be liable to an action for the same if it be illegal.

Clauses LII and LIII.—Steward to carefully preserve the books and accounts mentioned in this Act, and shall cause a register of all summonses, subpœnas, orders, judgments, warrants, executions, and returns thereto, of all penalties, all other proceedings of the great and small barmote courts, of all bills of directions, cross bills of directions, opinions of the grand jury, and other proceedings on views, to be fairly entered from time to time in a book belonging to the courts, which shall be kept at the office of the steward, and such entries in the said book or copies thereof, or of any of them, and also copies of the entries in the books and accounts mentioned in this Act, or any part thereof purporting to bear the seal of the court, and purporting to be signed and certified as a true copy by the steward, which copies the steward is hereby required to furnish to all persons requiring the same upon payment of the fees hereinafter specified, and all persons shall be at liberty at convenient times in the daytime to search and examine all books and documents in the custody of the barmaster or steward by virtue of this Act upon payment of the fees.

Clause LIV.—If any claim be made in respect of any mineral property taken in execution by any person not being the party against whom such process has issued, it is lawful for the steward upon application to issue an interpleader, and on proof that such mineral property was so taken in execution, stay proceedings and pay the complaining party sufficient compensation.

Clause LVIII.—Fees which to be paid, had, and taken by the steward, barmaster, grand jury, attorneys, and other persons shall be such as are contained in the third and fourth schedules to this Act; and no other fee, gratuity, or reward whatever shall be demanded, had, or taken by any of the said persons on any pretence whatever.

Clause LIX.—For the protection of persons acting in the execution of this Act it is hereby declared that all actions and prosecutions to be commenced against any person for anything done in pursuance of this Act shall be laid and tried in the county where the fact was committed, and shall be commenced within six calendar months after the fact committed, and not afterwards or otherwise.

Clause LXI.—In any action brought under the provisions of this Act in the county court or in any of the superior courts the plaintiff and defendant shall respectively be entitled to recover costs in the same cases and to the same extent as they would be entitled if the action was a common action of debt on simple contract in the county court or in any of the superior courts respectively.

Clause LXIII.—Nothing in this Act contained shall preclude any person from proceeding in any other court having jurisdiction therein in respect of any matter hereby made triable in the small barmote court.

Clause LXVIII.—The last is in reference to the saving rights of the Crown. That except as herein provided nothing in this Act shall extend to prejudice, diminish, alter, or take away any of the rights, privileges, powers, or authorities vested in or enjoyed by the Queen, her heirs, and successors, either in right of her crown or in right of her Duchy of Lancaster.

It will be seen from the foregoing and Articles III. and IV. which contain the pith of the second division of the Act, that with few exceptions, the protection of the miners' interests predominates over that of the landowners, and although the miners prior to the passing of the Act had in some instances exercised much greater power than the Act affords them their rights were often questioned and even jeopardised by long and expensive trials, so that some legal instrument was necessary to legally preserve their rights and privileges which had been theirs from times immemorial. The following extracts, the former from Manlove's Wirksworth Customs existing in the 16th century, when he wrote, and the latter from Haughton, of the 17th century, will be sufficient to prove the great powers enjoyed by the miners in these periods and still later (which are now allowed to a certain extent by the provisions of the Act).

> And be by custom that his mine doth free,
> A good estate thereby doth gain in fee.
> And if he die and leave behind a wife,
> The custom doth endow her for her life;
> But if the grove be left for want of stows,
> Or forfeited, her dowry she doth lose.

"We say, according to the customs of the mines within the wapentake of Wirksworth, that grooves, shafts or meers of ground kept in lawful possession are an estate of inheritance, and descend to the heirs and assigns of the owners and wives to have dowry in them."

MODERN HIGH EXPLOSIVES.

The use of high explosives, and especially of nitroglycerine compounds, has become so general both in mining and military engineering, that a systematic historical and technical account of them cannot fail to be at once useful and interesting. Such an account has been written by an American mining engineer—The Modern High Explosives, Nitroglycerine and Dynamite: their Manufacture, their Use, and their Application to Mining and Military Engineering; Pyroxyline or Guncotton, the Fulminates and Chlorates; also the Chemistry and Analyses of the elementary bodies which enter into the manufacture of the principal nitro-compounds. By Manuel Eissler, M.E. New York: John Wiley and Sons. London: Trübner and Co.—who has had considerable experience in connection with the substances about which he writes. Mr. Eissler characterises these high explosives as dangerous in the hands of the ignorant and vicious, and he might well have included the careless also. It is really marvellous how little attention we pay to dangers with which we are familar; and it may safely be affirmed that the sole reason that loss of life is no greater in connection with dangerous industries is that workmen do right by habit rather than by judgment or the exercise of thought, and many of the most serious calamities amongst workpeople are attributable to the want of constant reminders of the dangers they have to contend with. The high explosives, in the form in which they are now put into the hands of the engineer or workman, are, as Mr. Eissler says, entitled to "a place second to no agent man has yet employed to subdue the hostile forces of Nature," and it is essential that the nature and manipulation of them should be generally understood.

Although the history of the development of a discovery which has given us an article of every day use may not be regarded by every reader as absolutely essential, the fact should not be lost sight of that a knowledge of the processes that have been used, and the dangers that have been encountered and dealt with, tends largely to future benefit and safety. Mr. Eissler, therefore, wisely commences with a chapter on the chemistry and analysis of various bodies—sodium nitrate, potassic nitrate and nitric acid, sulphur, sulphuric acid, glycerine, the saccharine group, cellulose, and dextrine; and then follows a chapter on nitroglycerine—its manufacture and chemical and physical properties. In this there are interesting historical notes from the time of its discovery by Sombrero to the introduction of caps. He devotes a chapter to dynamite proper—nitroglycerine compounds, in which the absorbent is inactive—and another to the different dynamites with chemically active absorbents, such as lithofracteur, colonia powder, Brain's blasting powder, liquose, dualin, and explosive gelatine. The succeeding chapter on pyroxyline, guncotton, and nitrocellulose is particularly interesting, and with regard to the fumes of compressed guncotton and its use in mining operations, he has some very instructive remarks. He mentions that amongst the most grievous complaints of miners about modern explosives is the poisonous nature of the fumes emitted, which exposes them to most serious inconveniences. The gaseous products of the explosion of guncotton differ from those of nitroglycerine, as guncotton lacks 24·24 parts of oxygen in 100 for the complete conversion of its carbon into carbonic acid; hence there is a large amount of carbonic oxide in the resulting gases, which is very deleterious and even dangerous when pure guncotton is exploded in a close place. It is very clear, he says, to his mind why English manufacturers have adopted the admixture of oxidising salts (as saltpetre, nitrate of baryta) with guncotton, as the oxygen contained in the salts effects a more complete combustion, rendering the resulting gases less noxious than those resulting from pure guncotton.

With regard to the use of guncotton in mining operations, Mr. Eissler remarks that in the compressed form guncotton is susceptible, like nitroglycerine and its preparations, of explosion through the agency of an initiative detonation (cap). Compressed guncotton may, therefore, be applied with the same facility as dynamite and analogous substances in all mining and blasting work. On the whole, the mixture of guncotton and salts is not as sensitive to concussion as dynamite, consequently an extra strong cap is required to detonate it. As the highest nitrated product of cellulose (penta-nitro) still demands 24·24 parts of oxygen for the conversion into carbonic acid of the carbon in 100 parts, it is evident that the most explosive guncotton producable must be inferior in explosive power to nitroglycerine, which contains a very slight excess of oxygen. Some authorities claim that, in spite of the high state of compression to which English manufacturers have brought it, its strength is much less than dynamite. Here, also, it is clear why the English manufacturers have adopted the use of an admixture of oxidising salts as stated before; but the question will present itself, Is not the quickness of the explosion less rapid through this admixture than with pure cotton?

Where great local action is required nitroglycerine or dynamite competes advantageously with those substances. Some careful comparative experiments made by the German engineer corps at Graudentz, with Nobel's dynamite and Abel's compressed guncotton (made at the English Government works), demonstrated that dynamite produced somewhat greater local or shattering effects than guncotton. The plastic condition of dynamite and similar preparations gives them an advantage over the rigid compressed guncotton in blasting operations, as plastic powders may be inserted more readily into rugged and uneven bore-holes, and may be made by application of pressure thoroughly to fill the part charged. Every miner is aware of the importance of having his charge well home in the bottom of his hole, filling the whole cavity, and this can only be accomplished with a plastic powder. The increased effect derived from this mode of applying plastic explosives is far greater than is generally believed.

Volume for volume, it is impossible to put the same weight in a bore-hole for a certain given space; or, in other words, if one has a cartridge of dynamite, say 1 in. in diameter and 4 in. long, and one of compressed guncotton of the same size, the dynamite cartridge will weigh more. Consequently one has more explosive material in the same space owing to the higher specific gravity of dynamite, and as a consequence larger bore-holes are required when using guncotton, which increases the cost of mining. The cartridges of compressed guncotton are rigid, stiff, and every miner knows there should be no air chamber round the charge, for the expansion which it causes not only lessens the power in proportion to its dilution, but actually decreases the tension of the gas in a much greater measure. Stiff cartridges cannot be introduced into a bore-hole without leaving a considerable air chamber round the charge, particularly as bore-holes generally deviate a great deal from the circular shape. It is difficult to calculate, even approximately, the relative proportions of the unoccupied space and the charge; but certainly the loss will amount to considerable. When a loose mass of guncotton is ignited in the air it burns rapidly away without any explosive effect; but if the ignition takes place in a closed chamber the gases first produced immediately penetrate the mass of the cotton, and the whole is instantaneously decomposed. According to some authorities guncotton will not explode below a temperature of 280° F.

Guncotton has the great advantage over dynamite that it does not freeze, and, therefore, needs no thawing out, which is appreciated in cold climates. It does not suffer from exudation, and when properly made has good keeping qualities. One great advantage, again, of nitroglycerine and its preparations is that they remain unaltered under water, and can be used in wet bore-holes with the same facility as in dry holes, whereas although compressed guncotton when containing 10 per cent. or 15 per cent. of water can be exploded, it requires a very strong exploder or a dry primer to accomplish it, consequently for work under water dynamite is preferred. The cost of these two materials also differs greatly. The expense of producing guncotton must be 20 per cent. or 25 per cent. higher than dynamite, therefore when the question of competition arises the latter has the advantage. In the last six or seven years there have been brought forward in England (since Abel perfected his system of reducing guncotton to a fine state of division, and compressing it) several special preparations of guncotton, for which peculiar merits are claimed by their advocates.

A chapter on fulminating compounds and another on the analysis of nitroglycerine compounds brings the first part of the volume to a close; and the second part contains a chapter of directions for using the high explosives, and another on the application of electricity to blasting operations, the advantage of electric firing being carefully pointed out. In the third part the application of high explosives to particular purposes is fully discussed, the chapters on the principles of blasting and on mining and engineering problems connected with blasting being those in which the readers of the *Mining Journal* will take the greatest interest. The whole volume is ably arranged, and the various parts of the subject well worked out, so that all connected with mines will find it well worth studying.

THE ITALIA-SICILIAN TUNNEL.

With regard to the proposed tunnel connecting Sicily with the Continent, it may be interesting to record the ideas of Mr. Gabelli, C.E., regarding the momentous question of uniting the island with the Italian peninsula by means of a tunnel. The first thing to be considered, in his opinion, is the conformation of the sea bottom at the Straits. It is beyond all doubt, says he, that in a south-easterly and north-westerly course, starting from Pizzo, on the coast of Calabria, and ending at Sant' Agata, on that of Sicily, exists a submarine chain of mountains that separates the basin of the Mediterranean from that of the Adriatic.

The sides of this submarine chain of mountains are pretty steep, and, in fact, while the crest of this ridge is only 110 metres under the surface of the sea, at 2 kilos. away from it the depth attains 260 metres, in front of Messina it is 340 metres, and in the offing of Reggio it is 657 metres. The course of the contemplated tunnel is consequently clearly established by these hydrographical conditions. It only remains to be seen whether the nature of the soil is sufficiently solid and compact for the purposes required.

Not being able to examine the soil down to 120 metres under the surface, Signor Gabelli is obliged to have recourse to indirect proofs, and has thus recourse to the law and effects of the currents of the straits, from which he gathered the following results:—1. The tidal currents of the straits are all in one direction.—2. The current is not merely superficial, but is the same down to the bottom of the sea.—3. The strength of the current is maintained the same throughout.

From the facts Mr. Gabelli draws the conclusion that if the strength of the current, which attains 9 kilos. per hour, has not had the effect of sweeping away the ridge separating the two basins, it is of sufficient consistency to allow of a tunnel to pierce it with safety. But this was not sufficient to prove the feasibility of the undertaking; it was possible that the mountain, while being capable of resisting the action of the current, might not be sufficiently compact to prevent infiltration, so as to enable the execution of the works. It was consequently necessary to ascertain the exact formation of the rock to be pierced, and here geologists differ. The engineer Cortese is of opinion that the bottom of the straits, at least the upper portion of it, is of a crystalline formation, while Mr. Sequenza, on the contrary, thinks that the tunnel would in great measure pass through sand. Without entering into details of the manner in which it is proposed to construct the tunnel, which according to Mr. Gabelli would be 13·546 metres from end to end, this work is estimated at a cost of 70,000,000 frs., and would take, if everything went smoothly, five years to complete. The question is once made, would it pay, and would any company undertake a work of such magnitude on such scanty knowledge of the difficulties to be encountered?

The Steam-Engine Makers' Society.—The report for the past month just issued by the secretary of the Steam-Engine Makers' Society states that they are not able to show any improvement, but they regretted to record that their unemployed list showed an increase over those recently issued. The cause was not so far to trace, as the heaviest records were made by branches where marine engines were the principal trade of the district. In other localities not much change presented itself, as the generality of the stationary engine, mill wright, and tool shops were fairly employed; and locomotive firms also appeared to have an abundance of orders. The locomotive departments of railway companies were, however, as a rule, slack, and in some instances even on short time; so that they could only estimate that the orders at private firms were being made for foreign countries, notwithstanding the lectures they sometimes received about foreign competition. They had, however, pleasure in saying that although trade was far worse than they cared to see it, there were no disputes pending at the present time that in any way affected their members to a serious extent. One or two cases of a minor nature had arisen during the month, but not of such a character as to call for extended comment. Although their unemployed list was less satisfactory this month, they were sanguine enough to expect that there would soon be a revival in their favour, and it was quite possible their next report might bear proof of this. The impression seemed to be gaining ground that the depression had spent itself; and the excellence of the harvest, coupled with other causes, might lead to a brisk trade for some time to come. It was reported from the Clyde that a fair amount of orders for new ships had been given out, whilst similar rumours were circulated on the Tyne and the Wear. New orders were also being placed in the stationary engine-shops, and the opinion as to business generally was that we should have a far better winter for trade than was anticipated a few months back. In the Lancashire district, where employment generally is reported as steady, the Society have only about 1½ per cent. of their members in receipt of out-of-work support, but the returns for the branches throughout the country show an average of 2½ per cent. of members in receipt of out-of-work donation.

Special Tools for Heavy Ordnance Works.—Messrs. Hulse and Company, of Manchester, have just completed for the great ordnance works at Elswick a special machine for trepanning and for boring out steel ingots 40 in. diameter and to a length of about 25 ft. The machine is double-ended, and the ingots are bored through from each end simultaneously. The boring bars are propelled by large steel screws, and the ingot is held and rotated within a large hollow central head-stock. The boring bar does not revolve, but the work does, and is supported by suitable stays, by which the weight bearing upon the central head-stock is greatly reduced. The machine is 70 ft. in length over all and massive in construction, weighing about 50 tons; it is fitted with powerful spur gearing and enormous strap power; and, to ensure a perfectly true axial line through the rotating work, the utmost accuracy of construction has been absolutely necessary throughout. The same firm have also just sent out a very large lathe, specially constructed for ordnance work. This machine, which weighs about 80 tons, is 54 ft. in length, and has a spindle of about 14 in. diameter made of the best crucible cast-steel. This lathe is provided with double slide rests and is very powerful in the gearing and in the strap, so as to be capable of removing half a ton of metal per hour with the two tools; it has a 40-in. centre, and will take in work clear 5 ft. 6 in. diameter or a gun of the same diameter. A special feature in the machine is, that it is fitted with guide screws which have propeller-like thrust bearings.

Iron and Manganiferous Ores.—Mr. E. S. Fergusson (Cardiff Sept. 3) writes:—There has been very little business doing in the iron ore market during the past week, the ironmakers declining to pay sellers' quotations. The advance in freights has naturally tended to increase the prices of ore delivered, and unless freights rapidly fall buyers will shortly be compelled to pay advanced prices. Rubio (Bilbao or Decido) ore is quoted at 11s. 6d. per ton c.i.f. Cardiff or Newport, and 11s. 9d. Swansea, with 50 per cent. iron guaranteed. Freights from Bilbao remain firm at 5s. 3d. Manganiferous ore is still dull; but freights from Cartlagena show a rapid advance consequent on the outbreak of cholera in that part of Spain. Manganese ore firm at last week's prices.

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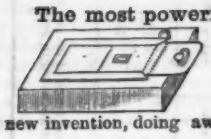

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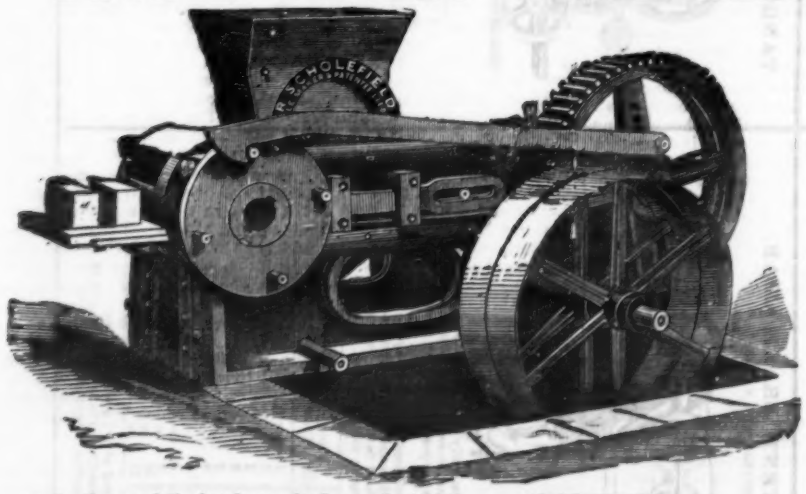

R. S. begs to call the attention of all Colliery Owners in particular to his PATENT SEMI-DRY BRICK MACHINE, and the economical method of making bricks by his patent machinery from the refuse that is taken from the pits during the process of coal-getting, which, instead of storing at the pit's mouth (and making acres of valuable land useless) is at once made into bricks at a very small cost, by R. S.'s Patent Brick-making Machinery. If the material is got from the pit hill, The following is about the cost of production, and the hands required to make 10,000 pressed bricks per day:—

2 men digging, each 4s. per day	£0 8 0
1 man grinding, 4s. 6d. per day	0 4 6
1 boy taking off bricks from machine, and placing them in barrow ready for the kiln, 2s. per day	0 2 0
1 boy greasing, 1s. 6d. per day	0 1 6
1 engine-man, 5s. per day	0 5 0
1 man wheeling bricks from machine to kiln, 4s. per day	0 4 0
Total cost of making 10,000 pressed bricks	£1 5 0, or 2s. 6d. per 1000.

(SETTING AND BURNING SAME PRICE AS HAND-MADE BRICKS.)

N.B.—Where the material can be used as it comes from the pit, the cost will be reduced in digging.

As the above Machinery is particularly adapted for the using up of shale, bind, &c., it will be to the advantage of all Colliery Owners to adopt the use of the said Brick-making Machinery.

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For use with Cherry's Patent Crab.

This Traveller comprises:—

Wrought-iron Lattice Girder.
A two-wheeled Carriage at each end.
Longitudinal Travelling Gear.

Span in feet.	35	40	45	50	55	60
Tested to 1 ton						
2 ,,						
3 ,,						
4 ,,						
5 ,,						
6 ,,						
7 ,,						
8 ,,						
10 ,,						
12 ,,						

Quotations on receipt of necessary particulars.

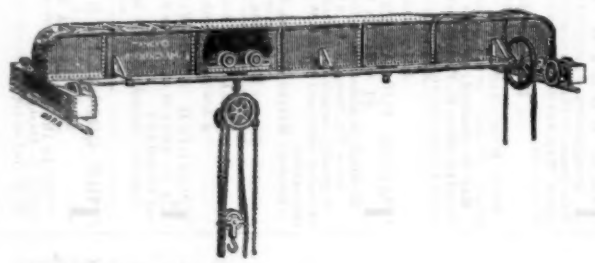
For particulars of Cherry's Patent Crab, which is recommended for use with this Traveller, see below. 105

TANGYES'

BOX GIRDER OVERHEAD TRAVELLER

WITH RUNNER.

For use with Pulley Blocks.



This Traveller comprises:—

A Wrought-iron Box Girder.
A two-wheeled Carriage at each end.
Runner to support Blocks.
Longitudinal Travelling Gear.

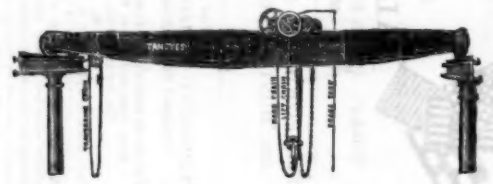
Span in feet.	15	20	25	30	35	40
Tested to 1 ton						
1½ ,,						
2 ,,						
2½ ,,						
3 ,,						
4 ,,						
5 ,,						
6 ,,						

Quotations on receipt of necessary particulars. 106

TANGYES'

DOUBLE PLATE GIRDER TRAVELLER

For use with Cherry's Patent Crab.



This traveller comprises:—

Two Wrought-iron Girders.
A two-wheeled Carriage at each end.
Longitudinal Travelling Gear.
A "Cherry's" Patent Brake Crab.

Span in feet.	10	15	20	25	30
Tested to 1 ton	£17	£22	£48	£53	£78
2 ,,	19	25	50	65	81
3 ,,	24	31	58	75	92
4 ,,	39	47	74	91	110
5 ,,	43	53	81	98	115
6 ,,	53	76	91	106	125
8 ,,	83	102	112	136	160
10 ,,	98	115	135	145	165

For intermediate spans take the mean between size above and below.
In ordering state height of lift for Chains. 107

TANGYES'

SINGLE GIRDER OVERHEAD TRAVELLER

WITH RUNNER

For use with Pulley Blocks.

This Traveller comprises:—

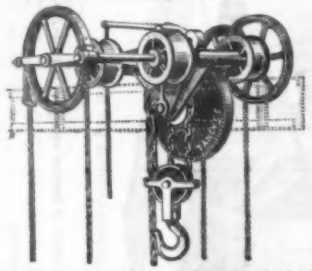
A Single Wrought-iron Girder.
A two-wheeled Carriage at each end.
Runner to support Blocks.

Span in feet.	12	14	16	18	20
Tested to 1 ton	£13 0	£13 10	£14 0	£15 0	£16 0
2 ,,	16 0	17 0	18 0	19 0	20 0
3 ,,	20 0	21 0	22 0	24 0	25 0
4 ,,	26 0	27 0	28 0	29 0	30 0

The Block shown in illustration is not included in price. 108

CHERRY'S PATENT BRAKE CRAB.

TANGYES LIMITED, SOLE MAKERS.



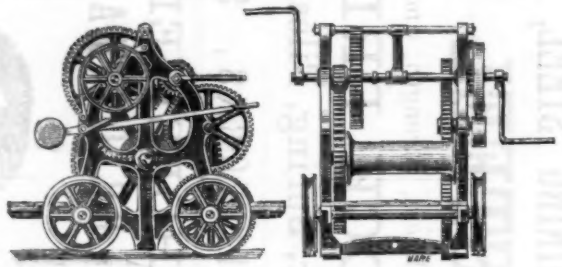
The Brake on this Crab automatically sustains the load when the motive power is entirely removed, without increasing the resistance during lifting. The friction necessary for this purpose is obtained from, and is in exact proportion to, the load itself.

In lowering, the pressure so produced is relieved by a lever to the extent necessary to allow the weight to descend at any desired speed. This device, however, does not prevent the load being gently lowered by pulling the hand chain in the direction reverse to that of lifting.

Tested to	Price Crab.	Price Lifting Chain	Price Hand Chain	Price Traverse Chain.	Size Lifting Chain.
1 ton	£7	9d. per ft.	7d. per ft.	...	⅜ in.
2 ,,	9	10d. ,,	7 ,,	...	7/16 ,,
3 ,,	15	11d. ,,	7 ,,	7d. per ft.	½ ,,
4 ,,	23	1/3 ,,	8 ,,	8 ,,	9/16 ,,
5 ,,	28	1/3 ,,	8 ,,	8 ,,	5/8 ,,
6 ,,	36	1/6 ,,	8 ,,	8 ,,	¾ ,,
7 ,,	42	1/6 ,,	8 ,,	8 ,,	¾ ,,
8 ,,	50	2/3 ,,	9 ,,	9 ,,	⅞ ,,
10 ,,	58	2/3 ,,	9 ,,	9 ,,	⅞ ,,
12 ,,	75	3/- ,,	10 ,,	10 ,,	1 ,,
14 ,,	85	3/- ,,	10 ,,	10 ,,	1 ,,

No Traverse Chain is required with 1 and 2 ton sizes.
Length of Hand and Traverse Chains is twice the height of lift.
,, of Lift Chain is twice the height of lift plus 4 ft. 110

TANGYES' OVERHEAD TRAVELLER CRAB.



CRAB WITH BRAKE AND WOOD PLATFORM.

No.	To test to, with Single Sheave Block	Weight.	Price.	Brass Bushing.
1	4 tons	17 cwts.	£27	£1 17 6
2	6 ,,	20 ,,	31	2 7 6
3	12 ,,	23 ,,	38	3 0 0

LONGITUDINAL TRAVELLING GEAR & TWO GANTRY CARRIAGES.

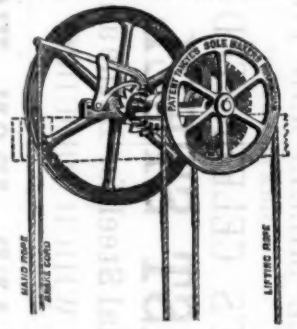
For use with above.

No.	Price.	Weight.
1	£13 10	11 cwts.
2	16 10	16 ,,
3	19 10	18 ,,

111

TANGYES'

HAND WAREHOUSE HOIST.



In this Hoist the lifting rope runs on a grooved pulley of large diameter—the balance weight hanging on one end of this rope and the cage on the other. Keyed on same shaft as the grooved pulley are the brake and spur wheels—the spur wheel being driven by a pinion keyed on the shaft of the hand rope wheel.

Tested to	Price.	Lift rope per foot.	Hand rope per foot.
5 cwts.	£12	4d.	4d.
10 ,,	15	6d.	4d.
15 ,,	25	9d.	4d.

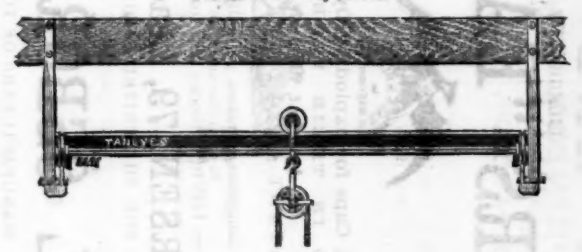
The 5 and 10 cwt. sizes are single gear.
The 15 cwt. size is double gear.
Cage, Balance Weight, and Guides, not included in above prices.
Quotations on receipt of necessary particulars. 104

TANGYES'

SINGLE GIRDER OVERHEAD TRAVELLER

WITH RUNNER

For use with Pulley Blocks.



This Traveller comprises:—

Wrought-iron Girder.
A two-wheeled Carriage at each end.
Runner for Pulley Block.

Tested to	Price for 10 feet span.	Add for each foot extra span.	Add for each foot Longitudinal Traverse.
10 cwts.	£10	10/-	5/-
12 ,,	12	12/-	6/-

This Traveller is not made of longer span than 16 feet.
Pulley Block is not included in price. 109

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MINING MACHINERY, MILLING MACHINERY

Of the MOST APPROVED AMERICAN PATTERNS.

GOLD MILLS.

The California pattern of Gold Stamp Mill is universally accepted as the most perfect, economic, and efficient made.

We have over 900 stamps in successful work in the various Western Gold Districts.

SILVER MILLS.

Silver amalgamation in Pans is essentially an American system evolved after years of work on the rich silver mines of Nevada.

We have over 500 Stamps, with necessary pans, settlers, roasting furnaces, &c., all of our own manufacture, at work in different silver camps of the United States, Mexico, and South America, and Phillipine Islands, Asia.

CONCENTRATION MILLS

Of the most approved German pattern and arrangement, or with Stamps and Frue Vanner Concentrators for low grade silver ores, light in lead. We have over 20 large German pattern mills at work on lead, zinc, or copper ores, and numerous Vanner mills on ores never before successfully concentrated.

Mining Pumps, Cornish pattern, of the largest sizes. **Hoisting Engines,** from 4 h.p. up to the largest direct-acting engines to sink 3000 feet.

SMELTING WORKS.

We have 80 Water Jacket Smelting Furnaces in use from 20 in. circular up to 54 in. by 60 in. for lead and silver smelting; and special High Jacket Furnaces for copper ores.

Engines of any size, plain slide valve, Corliss, compound Corliss, Boilers, all sizes. **Leaching Mills, Hallidie Wire Rope Tramways. Comet Crusher,** with capacity of 12 to 20 tons per hour. **White, Howell. Bruckner, and Stetefeldt Roasting Furnaces, &c.**

We have had twenty years experience in the manufacture solely of MINING MACHINERY, and have special facilities for shipping to all foreign parts through our New York Office, where all details of clearance, shipment, and insurance are conducted. Our machinery is already well known in Mexico, Peru, Chili, Venezuela, Honduras, and other South American countries.

Correspondence solicited. Descriptive Circulars and Catalogues on application

FRASER AND CHALMERS.

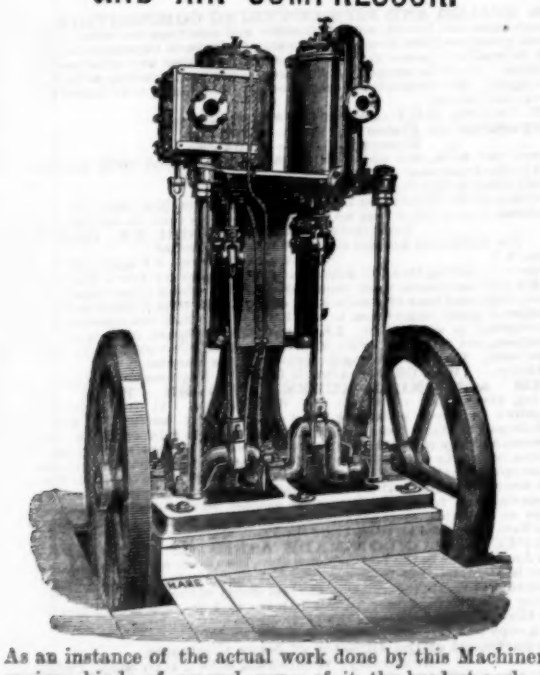
PRINCIPAL OFFICE AND WORKS.	NEW YORK OFFICE.
Fulton and Union Streets, Chicago, Ill, U.S.	No. 2, Wall Street, New York, U.S.

COLORADO OFFICE—CHEESMAN BLOCK, DENVER.

THE

"Champion" Rock-borer

AND AIR COMPRESSOR.



As an instance of the actual work done by this Machinery in various kinds of ground, some of it the hardest rock, it may be mentioned that in Cornwall, irrespective of the work performed by the "Champion" Rock-borers and Air-compressors purchased by various Mines, the drivage, rising, sinking, and stoping done by contract by the Proprietor with his own Machinery now amounts to over 1350 fathoms.

Several of these Air-compressors, ranging from 3½ to 12 tons in weight may be seen in constant work in the Camborne Mining District.

R. H. HARRIS,
ENGINEER,
63, QUEEN VICTORIA STREET, LONDON.

KIRKSTALL, BOWLING, AND STAFFORDSHIRE BAR IRON

RAILS—RAILS—RAILS—

New, slightly defective.

F.B. SECTION—BULL HEAD—DOUBLE HEAD—
16, 12, 14, 16, 18, 20, 24, 30, 40, 50, 60, 70, 75, 80 lb. per yard.
Sections on application to

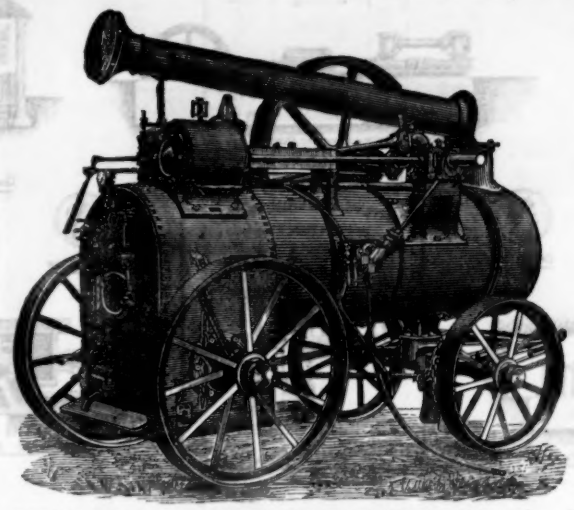
WILLIAM FIRTH, WATER LANE, LEEDS.

(POINT and CROSSINGS with all Fittings complete.
2000 tons in stock ready for delivery.

CLAYTON AND SHUTTLEWORTH,

STAMP END WORKS, LINCOLN, AND 78, LOMBARD STREET, LONDON.

The Royal Agricultural Society of England have awarded Every First Prize to CLAYTON and SHUTTLEWORTH for Portable and other Steam Engines since 1863, and Prizes at every Meeting at which they have competed since 1849.



Steam Engines, portable & fixed,
For Coals, Wood, Straw, and every kind of Fuel.
OVER 21,500 SOLD.

Thrashing Machines.
OVER 19,500 SOLD.

Straw, Corn, and Hay Elevators.

Chaff Cutters for Steam Power.

Grinding Mills.

Saw Benches.

Traction Engines, &c.

GOLD MEDAL AND FIRST CLASS CERTIFICATE at the Calcutta International Exhibition 1883–4.
THE ONLY GOLD MEDAL
AWARDED FOR
PORTABLE STEAM ENGINES.

GOLD MEDALS AND OTHER PRIZES have been awarded to CLAYTON AND SHUTTLEWORTH at all the important International and Colonial Exhibitions, including
LONDON, 1851 and 1862;
PARIS, 1855, 1867, and 1878;
VIENNA, 1857, 1866, and 1873.

Catalogues in English and all European Languages free on application.

THOMAS TURTON AND SONS,

MANUFACTURERS OF

Cast Steel for Mining and other Tools, Shear, Blister, and Spring Steel.

FILES OF SUPERIOR QUALITY.

EDGE TOOLS, HAMMERS, PICKS, AND ALL KINDS OF TOOLS FOR RAILWAYS, COLLIERIES, ENGINEERS, AND CONTRACTORS
LOCOMOTIVE ENGINE, RAILWAY CARRIAGE, AND WAGON SPRINGS AND BUFFERS.

SHEAF WORKS, AND SPRING WORKS, SHEFFIELD.

LONDON OFFICES:—90, CANNON STREET, E.C.

POTENTITE.

This unrivalled Explosive, as manufactured by the **New and Perfected Machinery** of the Company, is perfectly safe for transit, storage, and use, and is employed in every description of Mining or Quarrying Work, for Tunnelling, Pit Sinking, Engineering Work, and Submarine Operations, with the most complete success and satisfaction.

Potentite does NOT contain its own MEANS OF IGNITION, is free from Nitro-Glycerine, and its SAFETY has been specially demonstrated by public experiments.

Its strength is unequalled. Its action is certain.

In action it gives off neither flame, smoke, nor offensive smell. By its use labour is economised, as work can be resumed immediately after the shot is fired.

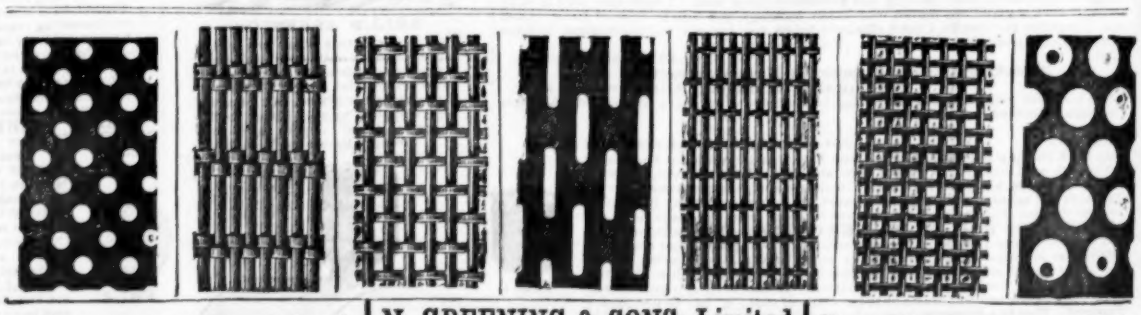
POTENTITE is specially adapted for export to hot climates, as it is unaffected by heat, and is free from dangerous exudations.

POTENTITE IS THE SAFEST STRONGEST, AND WORK FOR WORK, CHEAPEST EXPLOSIVE IN THE MARKET.

For particulars and prices, apply to—

THE POTENTITE COMPANY, LIMITED.

HEAD OFFICE—3, FENCHURCH AVENUE, LONDON, E.C.



Extra Treble Strong Wire Cloth and Perforated Metals in Steel, Iron, Copper, Brass, Zinc, Bronze.

Made in all Meshes and Widths.

N. GREENING & SONS, Limited,

Wire Manufacturers and Metal Perforators,
WARRINGTON.

Jigger Bottoms, Trommels, Cylinder Covers, Riddles, Sieves for Diamond, Gold, Silver, Copper, Lead and Tin Mines.

Samples and Prices free on application.

FRANCIS MORTON AND CO., LIMITED, LIVERPOOL,

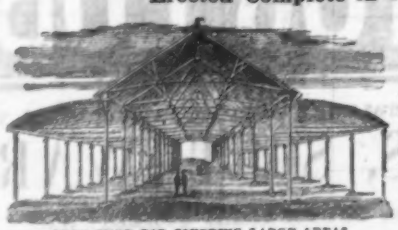
MANUFACTURERS OF

GALVANISED CORRUGATED IRON ROOFS, BUILDINGS, AND SHEDDING,

WHICH THEY HAVE EXTENSIVELY ERECTED FOR THE REQUIREMENTS OF

Forges, Rolling Mills, Puddling Sheds, Ironworks, and Collieries

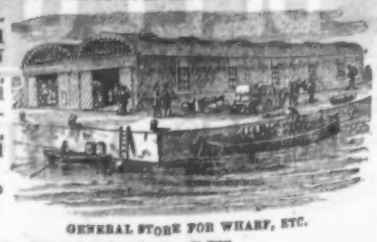
Erected Complete in this Country, or prepared to Plan for Erection Abroad.



OPEN SHED FOR COVERING LARGE AREAS

GALVANISED OR PAINTED CORRUGATED IRON ROOFING PLATES and TILES. HEAVY CORRUGATED IRON PLATES for fireproof floors, roadways, parapets, &c. (for producing which F. M and Co. have recently laid down powerful Hydraulic Machinery). Wrought-iron Tanks, Guttering, and General Constructional Wrought Ironwork.

DESIGNS PREPARED, AND ILLUSTRATED DESCRIPTIVE CATALOGUES FORWARDED ON APPLICATION



GENERAL STORE FOR WHARF, ETC.

ondon Office: 9, Victoria Chambers, Victoria Street), Westminster, S.W.
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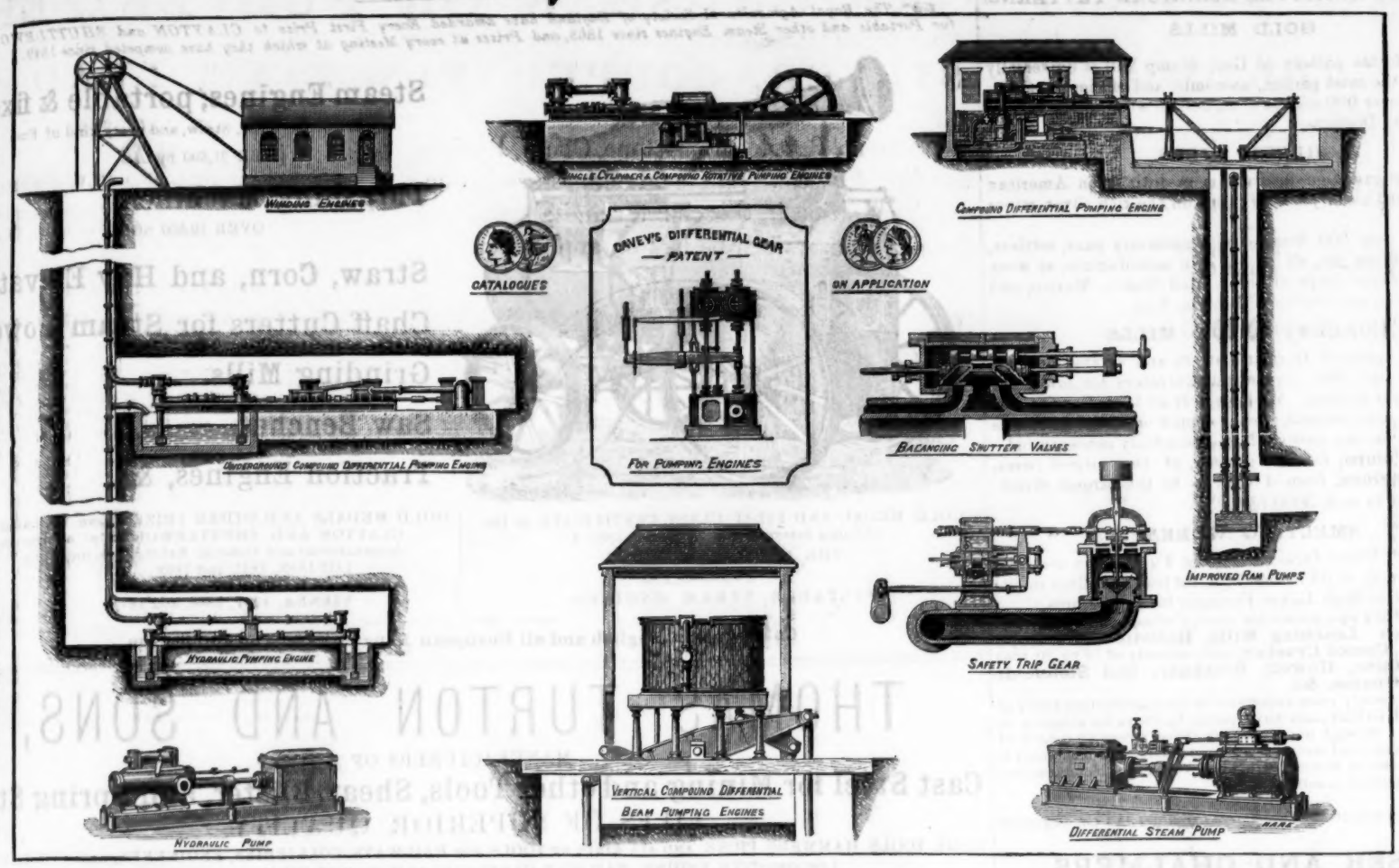
HATHORN, DAVEY & CO.,

PUMPING MACHINERY.

MINING MACHINERY.



SUN FOUNDRY, LEEDS.

BELL'S ASBESTOS.

BELL'S PATENT ASBESTOS BLOCK PACKING for High-Pressure Engines.

The following testimonials refer to this Packing:—

Mona Lodge, Amlwich, Anglesey,
2nd August, 1884.

Dear Sir,—I have much pleasure in answering your note. Bad times in mining have compelled me to try all kinds of expedients in order to effect saving; some have succeeded and some have failed, but my underground manager, Capt. Hughes, has just said to me by the telephone—"The Asbestos Packing is the best thing ever brought here."

It saves money and trouble, but like my gas purifying oxide it lasts so long that you must not expect another order from me for twelve months at least.

Yours truly, T. F. EVANS,
Late H.M. Inspector of Metalliferous Mines.

Mr. J. Bell.

Manchester, Sheffield, and Lincolnshire Railway—Steamship Department,
Grimsby, April 10th, 1884.

Dear Sir,—I have much pleasure in stating that after a trial of over nine months, and comparing it with other packings, I can confidently recommend your Asbestos Packing. It is especially valuable when high-pressures are employed, as in cases where other packings have perished, owing to high temperatures, your packing has invariably stood well. I have also used it with complete success when a gland has heated with other packings, and also in cases of badly scored piston rods. I consider the results I have obtained by its use for our marine engines to have been in every way highly satisfactory.

Yours truly,
G. H. CLARKE, Sup. Engineer.

Mr. J. Bell.

Department of the Director of Navy Contracts,
Admiralty, Whitehall, 20th June, 1884.

Sir,—I have to inform you that your tender has been accepted for Bell's Rolled Cloth Asbestos Packing to sample submitted:—Elastic core ... ... Square.
" " ... ... Round.

To Mr. John Bell. JOHN COLLETT, Director of Navy Contracts.

The Patent Block Packing is square, as Fig. 1 and Figs. 2 and 3 represent the Round Block Packing with solid and hollow rubber core, and Fig. 4 without core, but with rubber inlaid. As these packings are extensively imitated, and as it is a common practice among dealers and agents to supply the cheaper manufactures at my list prices, users are requested to see that the packing supplied to them bears the trade mark.

BELL'S ASBESTOS BOILER PRESERVATIVE.—This useful mixture by absorbing the free oxygen that is in the water entirely checks pitting and corrosion. It also disintegrates incrustation so immediately as to prevent its adhering to the plates. Not only is a great economy of fuel effected by keeping boilers clean, but the risk of having the plates burned is thereby obviated. It has been computed that $\frac{1}{16}$ in. thick of incrustation causes a waste of 15 per cent. of coal; $\frac{1}{8}$ in., 60 per cent.; $\frac{1}{4}$ in., 150 per cent. Thus the Preservative avoids the great risks which are inseparable from scaled plates, lengthens the life of a boiler, and covers its own cost a hundredfold by economy of fuel. It is entirely harmless, and has no injurious action on metals. It can be put into the feed tank or boiler, as may be most convenient. Sold in drums and casks bearing the Trade Mark, without which none is genuine.

BELL'S ASBESTOS YARN and SOAPSTONE PACKING for Locomotives and all Stationary Engines running at very high speed with intense friction.

Sandwell Park Colliery, Smethwick, 1st February, 1884.

To Bell's Asbestos Works.

Dear Sirs,—I have much pleasure in stating that I have used your Asbestos Packing for the last 13 months for our large winding engines which are running night and day, and also for the fan, pumping, and hauling engines at the above Colliery, and during that period we have not used more than one-third the Packing we had formerly; and this I attribute to your Packing on account of its great durability and general excellence of quality.—I am, dear Sirs, yours faithfully,

THOMAS WINTER, Colliery Engineer.

TRADE MARK.

BELL'S ASBESTOS.

The goods of this house are of the highest quality only, and no attempt is made to compete with other manufacturers by the supply of inferior materials at low prices. All "home" orders should be sent direct to the undermentioned depôts and not through Agents or Factors.

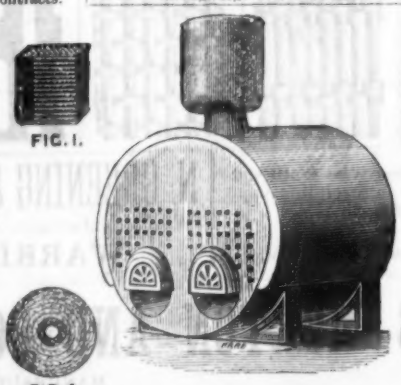


FIG. 1.

FIG. 2

FIG. 4.

FIG. 3.

BELL'S ASBESTOS BOILER AND PIPE COVERING COMPOSITION, for coating every class of steam pipes and boilers, non-combustible and easily applied when steam is up; adheres to metals and preserves them from rust; prevents the unequal expansion and contraction of boilers exposed to weather; covers 50 per cent. more surface than any other coating, and is absolutely indestructible. It can be stripped off after many years' use, mixed up with 20 per cent. of fresh, and applied again. The composition is supplied dry, and is only to be mixed with water to the consistency required for use.

A Horizontal Boiler, 17 ft. 6 in. long, 15-H.P., gave the following results:—

Temperature on Plates - - - 186 deg.
" " Covering - - 94 deg.

One ton of coal was saved per week, and although the fire was raked out every evening, 20 lbs. of steam were found in the boiler next morning.

The following Testimonials refers to this Covering:—

Offices of the Wimbledon Local Board, Wimbledon, Nov. 28th, 1883.

Dear Sir,—It may interest you to know that we save exactly 40 per cent. in fuel through using your covering.

Yours truly, W. SANTO CRIMP, C.E., F.G.S.

The Tamar and Kit Hill Granite Company (Limited),
Gunnislake, Tavistock, 8th April, 1884.

Mr. John Bell, Southwark, S.E.

Sir,—I have much pleasure in stating that the Asbestos covering applied by you to the boiler of our travelling crane at Kit Hill has yielded most remarkable results. Since it has been in use we have saved fully half our coals, and have effected a great saving in the time it takes to get up steam, which is often a matter of great importance to us. I should add that the crane runs on high gantries, and is fully exposed to all weather. I have formed the highest opinion of your Asbestos as used for this purpose, and as you are aware, have had another boiler similarly covered, though it has not since been used. I can most strongly recommend the material.

I am, Sir, yours faithfully, W. J. CHALK, Assoc. M. Inst. C.E., Engineer and Manager.

BELL'S ASBESTOS and INDIA-RUBBER WOVEN TAPE and SHEETING, for making every class of Steam and Water Joints. It can be bent by hand to the form required without puckering, and is especially useful in making joints of manhole and mudhole doors. It is kept in stock in rolls of 100 ft., from ½ in. to 3 in. wide, and any thickness from $\frac{1}{32}$ in. upwards. Manhole covers can be lifted many times before the renewal of the jointing material is necessary. The same material is made up into sheets about 40 in. square, and each sheet bears the Trade Mark, without which none is genuine. It is very necessary to guard against imitations of this useful material, and to secure themselves against being supplied with these inferior articles at my price, users are recommended to see that every 10 ft. length of the Asbestos Tape purchased by them bears the Trade Mark.

BELL'S SPECIAL LONDON-MADE ASBESTOS MILLBOARD, for Dry Steam Joints, made of the best Asbestos fibre, is well-known for its toughness and purity, and is absolutely free from the injurious ingredients frequently used to attain an appearance of finish, regardless of the real utility of the material. Made in sheets measuring about 40 in. square, from 1-64th in. to 1 in., and ½ millimetre to 25 millimetres thick. Each sheet bears the Trade Mark.

The following copy of acceptance of tender refers to above:—

Department of the Director of Navy Contracts.
Admiralty, Whitehall, S.W., 17th May, 1884.

Sir,—I have to inform you that your tender for Asbestos Millboard has been accepted.—Mr. John Bell. JOHN COLLETT, Director of Navy Contracts.

BELL'S ASBESTOS EXPANSION SHEETING (PATENT). This Sheeting is another combination of Asbestos with India-rubber, giving to the steam user the special advantages of both materials. The India-rubber Washer is protected from the action of heat and grease by an outer coating of vulcanised Asbestos Cloth, thus producing an excellent joint where expansion and contraction render other materials unserviceable. This material is admirably suited to steam pipe joints and every class of valve. Valves made of this material are very durable, as they are not subject to injury by oil.

BELL'S "ASBESTOS LUBRICANT." "REGD"

ILLUSTRATED PRICED CATALOGUE FREE ON APPLICATION TO

BELL'S ASBESTOS WORKS, SOUTHWARK, LONDON, S. E.

OR THE DEPOTS—118a, SOUTHWARK STREET, S.E.,

Victoria Buildings, Deansgate, MANCHESTER. 11 and 13, St. Vincent Place, GLASGOW. 39, Mount Stuart Square, CARDIFF. 21, Ritter Strasse, BERLIN.

THE BLAKE-MARSDEN NEW PATENT IMPROVED STONE BREAKERS AND ORE CRUSHERS.

ORIGINAL PATENTEE AND ONLY MAKER.

H. R. MARSDEN,

ALSO PATENTEE AND ONLY MAKER OF THE

NEW PATENT FINE CRUSHER OR PULVERIZER,

FOR REDUCING TO AN IMPALPABLE POWDER, OR ANY DEGREE OF FINENESS REQUIRED,

GOLD QUARTZ, SILVER, COPPER, TIN, ZINC, LEAD

AND ORES OF EVERY DESCRIPTION

PATENT REVERSIBLE CUBING and CRUSHING JAWS, IN FOUR SECTIONS,

WITH PATENT FACED BACKS, REQUIRING NO WHITE METAL IN FIXING.

CRUCIBLE CAST-STEEL CONNECTING RODS. RENEWABLE TOGGLE CUSHIONS, &c.

OVER **4000** IN USE.

EXTRACTS FROM TESTIMONIALS.
PULVERIZER.

"I have great pleasure in bearing testimony to the merits and capabilities of your patent combined fine crusher and sieving apparatus. I have tried it on a variety of ores and minerals, and it pulverizes them with equal success. You can put in a small paving stone and bring it out like flour."

"In reply to your favour, I have much pleasure in informing you that the 12×3 Pulverizer we had from you is giving us every satisfaction. The material we are operating on is an exceptionally hard one. I am well satisfied with its working."

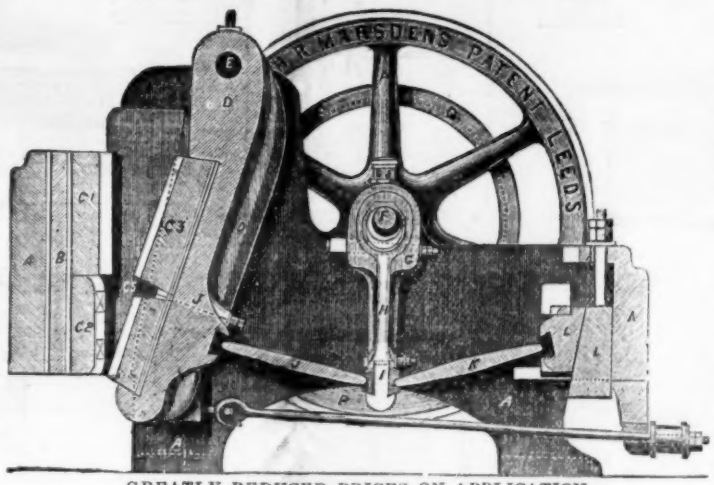
"Our experience is that the motion and mechanical arrangements of your machine are the best for pulverising that we have ever met with."

"The reports from our mines as regards the working of your Fine Crusher (20×5) recently supplied are very favourable, although we cannot quote you exact figures. On being got into position it was tried *by hand*, with the result that it made short work of the biggest pieces of ore we put into the hopper. You might say how long you would take to deliver another of the same size."

"As I once before stated, your machine is a perfect pulverizer."

"I am sure the machine will be a success, and a great one, and there is any amount of demand for such a machine. We can work it with 20 lbs. of steam, and our engine, which is a 12-h.p., plays with the work, in fact we run the Stonebreaker and the Pulverizer both together with 35 lbs."

Also Cement, Barytes, Limestone, Chalk, Pyrites, Coprolite, &c., &c. These Machines are in successful operation in this country and abroad, and reference to users can be had on application.



GREATLY REDUCED PRICES ON APPLICATION.

AWARDED OVER

60

FIRST-CLASS GOLD AND SILVER MEDALS.

ADOPTED BY THE PRINCIPAL CORPORATIONS, CONTRACTORS, MINING COMPANIES, &c., IN ALL PARTS OF THE WORLD.

ROAD METAL BROKEN EQUAL TO HAND, AT ONE-TENTH THE COST.

EXTRACTS FROM TESTIMONIALS.—STONEBREAKER.

"I now order Three of your Stone Crushers, size 15 × 10, to be your very best construction, and to include two extra sets of Jaws and Cheeks for each. The last two 24×13 machines you sent which are at work in this colony, are doing very well. You will soon find that the railway contractors will adopt your machine in preference to the colonial ones—two of which I have. I know of contractors have had as many as nine of them, which have not given very good satisfaction. Once they know of yours thoroughly I believe you will do a good trade with the colonies. For reference to the high character of your constructions you can refer to me, having used them with the very best results, both in New Zealand and this colony, and much prefer them to the colonial article, both in point of construction and less liability to go out of order. The material we are crushing is very hard blue stone, for railway ballast purposes. Push on with the order as quickly as possible; I do not think it necessary to have any engineering inspection. I have brought your machines prominently under the notice of all the contractors in this colony, likewise the Government. Many of the contractors have spoken to me in reference to their capabilities, and I could only tell them that they are by far and away the best and most economical I ever used. The very fact of me having purchased now Eleven from you at various intervals and various sizes, and of above 12 years ago, and having tried all the other makers, is sufficient guarantee of the capabilities and the working of your machines. Yours in every way surpass all others."

"Some of your testimonials do not give your machines half the due. I have seen men hammering away on a big rock for a quarter of a day which your machine would reduce to the required size in a quarter of a minute. I would guarantee that your largest size machine would reduce more of the Cornish tin capels (which is the hardest rock of England) n a day than 200 men, and at 1-25th the cost."

FOR CATALOGUES, TESTIMONIALS, &c., APPLY TO THE SOLE MAKER,

H. R. MARSDEN, SOHO FOUNDRY, LEEDS.

JOHN CAMERON'S

SPECIALITIES ARE HIS

STEAM PUMPS

FOR

COLLIERY PURPOSES.

Specially adapted for forcing Water any height

ALSO, FOR

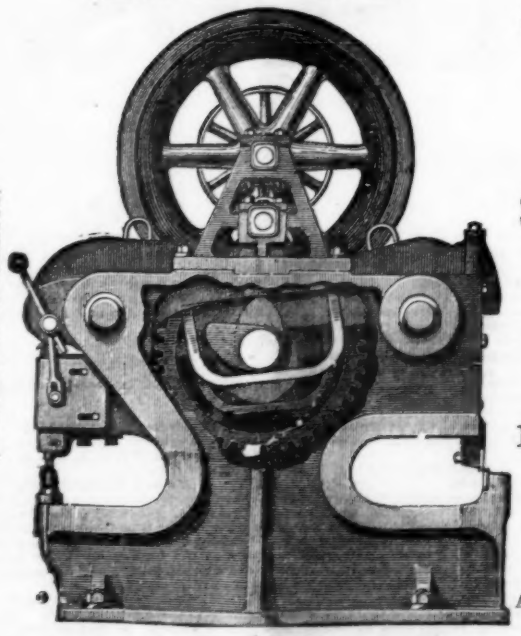
SINKING, FEEDING BOILERS AND STEAM FIRE ENGINES,

Of which he has made over 9000.

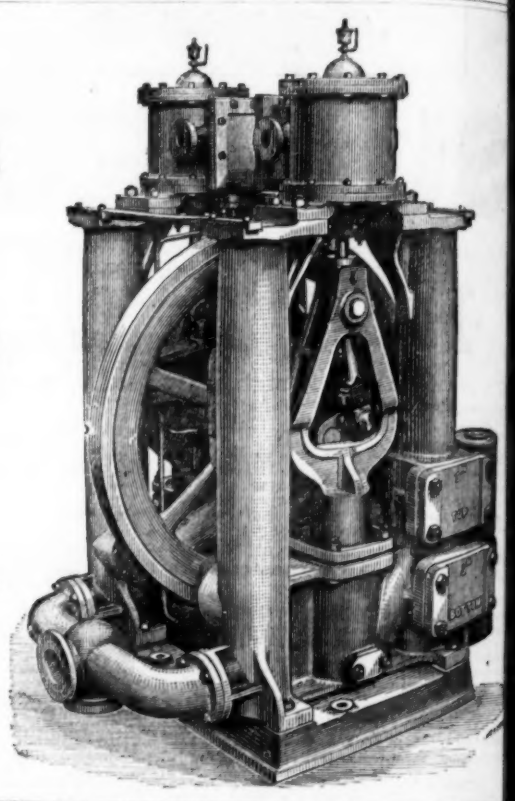
ALSO, HIS

PATENT CAM AND LEVER PUNCHING & SHEARING MACHINES.

FLY-WHEELS ON BOTH SIDES.



DISENGAGING APPARATUS.



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